Joonas Nättilä

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Sex: Male
Born: June 25th, 1989, Tornio, Finland
Nationality: Finnish Citizen
Languages: Finnish (native), English, Swedish

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Research interests

High-energy astrophysics: neutron stars, X-ray bursts, equation of state; black holes, accretion; relativity, ray tracing.
Computational physics: fluid and plasma dynamics, high performance computing, numerical methods.
Statistics: Bayesian inference, Monte Carlo methods.

Education

2014– **Ph.D. in Astrophysics (in progress, expected 2017)**, University of Turku, Finland.
Supervisor: Prof. Juri Poutanen, Director of Tuorla Observatory.

2012–2013 **M.Sc. in Astronomy**, University of Oulu, Finland.

2008–2012 **B.Sc. in Physics**, University of Oulu, Finland.

Professional experience

2016 **Nordita Visiting Ph.D. Fellow**, Nordita, Stockholm, Sweden.

Summer 2013 **Research Assistant**, University of Oulu, Finland.
Constraining neutron star mass and radius.

Summer 2012 **University Trainee**, University of Oulu, Finland.
Dependence of X-ray burst spectral evolution on accretion rate.

Summer 2011 **Research Assistant**, University of Oulu, Finland.
Thermonuclear type-I X-ray bursts from neutron stars.

Teaching

Fall 2016 **Teaching Assistant, Optics**, University of Turku, Finland.
Exercise assistant of Optics course (6 ECTS).

Summer 2016 **Lecturer, High Performance Computing Summer School**, CSC, Finland.
Summer 2015 Lecturer & tutor for Finnish IT Center for Science HPC Summer School.

Spring 2015 **Lecturer, Software tools in Physics**, University of Turku, Finland.
Spring 2016 Lecturer of the "Introduction to Unix" section of the course (3 ECTS).

Summer 2013 **Teaching Assistant, Thermophysics**, University of Oulu, Finland.
Summer 2012 Exercise assistant of Thermophysics summer course (6 ECTS).
Summer 2011

Summer 2012 **Teaching Assistant, Electricity and Magnetism**, University of Oulu, Finland.
Exercise assistant of Electricity and Magnetism summer course (4 ECTS).

2011 – 2012 **Assistant, Laboratory Exercises in Physics 1**, University of Oulu, Finland.
Assistant in Laboratory Exercises in Physics 1 (3 ECTS), in the fall and spring semesters.

Summer 2011 **Teaching Assistant, Mathematics of Physics**, University of Oulu, Finland.
Exercise assistant of Mathematics of Physics summer course (6 ECTS).

Summer 2011 **Teaching Assistant, Waveforms and Optics**, University of Oulu, Finland.
Spring 2011 Exercise assistant of Waveforms and Optics (6 ECTS) in spring and summer courses.

Mentoring & Supervision

Co-supervised 1 M.Sc. thesis, 1 B.Sc thesis. Currently co-supervising 1 M.Sc. thesis.

2015–	**Jere Kuuttila**, M.Sc. thesis research project, University of Turku, Finland. X-ray burst time evolution dependency on the spectral state.
2015–2016	**Tuomo Salmi**, M.Sc. thesis research project, University of Turku, Finland. Neutron star mass and radius constraints from pulse profile modeling.
2014–2015	**Jere Kuuttila**, B.Sc. thesis research project, University of Turku, Finland. X-ray bursts as standard candles.

Memberships

2015–	Member of ESA XIPE satellite Science Team (SWG2.2 Accreting Millisecond Pulsars)
2014–	Member of organizing committee for CSC HPC Summer Schools
2013–	JuliaLang organization
2012–	Finnish Astronomical Society

Presentations & Talks

3 invited, 12 contributed talks.

Invited:

2016	**From quarks to gravitational waves: Neutron stars as a laboratory for fundamental physic**, CERN.
2016	**COSPAR 2016, E1.1: Accreting Neutron Stars and Stellar-mass Black Hole**, Istanbul, Turkey. (*Conference canceled!*)
2016	**JINA-CEE Symposium: Neutron Stars in the Multi-Messenger Era**, Ohio, USA.

Contributed:

2016	**INT-16-2b: Phases Of Dense Matter Workshop**, Seattle, USA.
2016	**Nordita Workshop on accretion onto magnetized neutron stars**, Stockholm, Sweden.
2015	**Workshop on Relativistic Astrophysics**, Kavalto, Finland.
2015	**University of Maryland, Colloquium speaker**, Washington, USA.
2015	**University of Tennessee, Colloquium speaker**, Tennessee, USA.
2015	**The Neutron Star Radius, And All That Jazz**, Montreal, Canada.
2015	**40 years of X-ray bursts: Extreme explosions in dense environments**, Madrid, Spain.
2014	**ESAC (visiting scientist presentation)**, Madrid, Spain.
2014	**Physics of Neutron Stars Conference**, St. Petersburg, Russia.
2014	**Astronomers' Days**, Savonlinna, Finland.
2013	**European Week of Astronomy and Space Science**, Turku, Finland.
2012	**Astronomers' Days**, Porvoo, Finland.

Funding

Research

2015–2017 **UTUGS Physical and Chemical Sciences funded 3yr. Ph.D. scholarship**
Constraining neutron star mass and radius.

2014–2015 **∼ 23 000 eur Väisälä Foundation grant**
Magnetar atmosphere models: breaking the barrier between observations and theory

Travel

2016 **∼ 1 000 eur CERN** From quarks to gravitational waves workshop.
2016 **∼ 2 000 eur Magnus Ehrnrooth Foundation** JINA-CEE symposium (Ohio) and COSPAR 2016 (Istanbul).
2016 **∼ 1 000 eur UTUGS Physical and Chemical Sciences** JINA-CEE symposium (Ohio).
2016 **∼ 2 000 eur ESAC** Visiting scientist (host: Jari Kajava).
2015 **∼ 1 000 eur UTUGS Physical and Chemical Sciences** The Neutron Star Radius, and All That Jazz -conference, Montreal.
2015 **∼ 1 000 eur ESAC** 40 years of X-ray bursts - conference.
2014 **∼ 1 000 eur ESAC** Research visit (host: Jari Kajava).

+ Some smaller travel grants and reimbursements.

Conference organization

2015 **Workshop on Relativistic Astrophysics**, Kavalto, Finland.
Member of the local organizing committee.

2015 **PCS Annual Seminar day**, University of Turku, Finland.
Chairman & member of the organizing committee.

Public outreach

2016 Finnish science blog reported on our work about heavy metal enrichment of the Universe from thermonuclear X-ray bursts (tiedetuubi.fi)

Open source software

Bender, ray tracing code, general relativistic ray tracing code for computing radiation from rapidly rotating oblate neutron stars. https://github.com/natj/bender

Hydro, modular 2d hydrodynamical code with unsplitted HLLC Rieman solver, second order Runge-Kutta time-stepping, and linear piecewise reconstruction. https://github.com/natj/hydro

CellularAutomata.jl, Julia library for elementary and totalistic Cellular automata modeling. https://github.com/natj/CellularAutomata.jl

Publications

7 publications, 80 citations; h-index 4, g-index 7, i10-index 3 (ADS since 2014).

Peer-reviewed scientific articles

[7] **J. Nättilä** and P. Pihajoki. Radiation from rapidly rotating oblate neutron stars. *A&A*, *submitted,* 2016.

[6] V. F. Suleimanov, J. Poutanen, **J. Nättilä**, J. J. E. Kajava, M. G. Revnivtsev, and K. Werner. The direct cooling tail method for X-ray burst analysis to constrain neutron star masses and radii. *MNRAS*, *in press,* 2016, [arXiv:1611.09885].

[5] J. J. E. Kajava, **J. Nättilä**, J. Poutanen, A. Cumming, V. Suleimanov, and E. Kuulkers. Detection of burning ashes from thermonuclear X-ray bursts. *MNRAS*, 464:L6–L10, January 2017, [arXiv:1608.06801].

[4] **J. Nättilä**, A. W. Steiner, J. J. E. Kajava, V. F. Suleimanov, and J. Poutanen. Equation of state constraints for the cold dense matter inside neutron stars using the cooling tail method. *A&A*, 591:A25, June 2016, [arXiv:1509.06561].

[3] **J. Nättilä**, V. F. Suleimanov, J. J. E. Kajava, and J. Poutanen. Models of neutron star atmospheres enriched with nuclear burning ashes. *A&A*, 581:A83, September 2015, [arXiv:1507.01525].

[2] J. J. E. Kajava, **J. Nättilä**, O.-M. Latvala, M. Pursiainen, J. Poutanen, V. F. Suleimanov, M. G. Revnivtsev, E. Kuulkers, and D. K. Galloway. The influence of accretion geometry on the spectral evolution during thermonuclear (type I) X-ray bursts. *MNRAS*, 445:4218–4234, December 2014, [arXiv:1406.0322].

[1] J. Poutanen, **J. Nättilä**, J. J. E. Kajava, O.-M. Latvala, D. K. Galloway, E. Kuulkers, and V. F. Suleimanov. The effect of accretion on the measurement of neutron star mass and radius in the low-mass X-ray binary 4U 1608-52. *MNRAS*, 442:3777–3790, August 2014, [arXiv:1405.2663].

Theses

[2] **J. Nättilä**. Mass and radius constraints for neutron stars using the cooling tail method. Master's thesis, University of Oulu, Finland, 2013. oulu-201312041966.

[1] **J. Nättilä**. Spectral analysis of X-ray bursts from neutron stars: IGR J1747–2721 (*Neutronitähtien röntgenpurkaukset ja niiden spektrianalyysi: IGR J1747–2721*). Bachelor's thesis, University of Oulu, Finland, 2012.