William G. Newton

Updated August 29, 2016

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Born: March 6, 1978 – Blackpool, UK
Nationality: UK; US Permanent resident.

Current position

2012-present *Assistant Professor*, Texas A&M University-Commerce.

Areas of specialization

nuclear physics, astrophysics, science education

Appointments held

2008-2009 *Postdoctoral Researcher*, Texas A&M University-Commerce.
2009-2012 *Adjunct Assistant Professor*, Texas A&M University-Commerce.

Education

2002-2008 DPhil in Physics, University of Oxford
Thesis Title: "The phase transition to uniform nuclear matter in supernovae and neutron stars"
Supervisor: Dr. Jirina Rikovska Stone

2000-2002 MSc in Physics, University of Tennessee
Thesis Title: "Giant resonances in argon isotopes"
Supervisor: Prof. Michael Strayer

1996-2000 MPhys, University of Oxford
Final honours school of natural science: Physics, 2:1
MPhys project: "The diffusion of stars near the sun"
Supervisor: Prof. James Binney

Grants and Proposals

Funded

2016-2017 "A Community-Based Approach to Building the Capacity of Physics Teacher Preparation at Texas A&M University-Commerce",
NSF Noyce Teacher Scholarship Program, $74,948
PI **W.G. Newton**, co-PIs Robynne Lock and Gilbert Naizer

2014-2017 "The impact of short-range correlations in nuclear matter on the equation of state, composition and dynamics of neutron stars",
Cottrell College Science Award 22741, $35,000,
PI: **W.G. Newton**

2011-2014 "Extracting the Symmetry Energy of Dense Neutron-Rich Nuclear Matter from Astrophysical Observations",
NASA Astrophysics Theory Program, Grant number 10-ATP10-0095, $399,870,
PI: Bao-An Li; Science-PI **W.G. Newton**

Pending

2015 "A Lattice Boltzmann Simulation of Exotic Soft Condensed Matter in Neutron Star Crusts",
NSF CAREER, $491,565
PI: **W.G. Newton**

Awards and Fellowships

2014 Junior Faculty Research Award

2014 Center for Faculty Excellence & Innovation 2014-2015 Faculty Fellowship in Teaching & Learning,
Project Title: "Innovative Online Masters Courses in Physics for Teachers."

Teaching

Bolded courses were developed as face-to-face classes from scratch.
Bolded, italicized courses were developed from scratch as face-to-face classes and then as online classes.

2009-present Texas A&M University-Commerce. Courses taught:
IS 351 and IS 352: Integrated science (General science classes for education majors)
ASTR 102 - Stars and the Universe
PHYS 2426 Calculus Based Physics II (Electricity and Magnetism), redeveloped as a studio physics class
PHYS 515 (General Relativity, graduate level)
PHYS 561 (Astronomy and Astrophysics for Educators, graduate level)
PHYS 526 (Quantum Mechanics for Educators, graduate level)
PHYS 565 (Thermodynamics for Educators, graduate level)

2008 Oxford Tutors UK - Tutored high school students in physics and math in preparation for their A-level exams (final high school exams)

2003-2008 University of Oxford: College Tutor
Organized and gave tutorials; set and marked tutorial work and exams.
Courses taught by undergraduate year (out of the four-year course):

1st Mathematical Methods; Electromagnetism; Mechanics; Optics

2nd Mathematical Methods; Quantum Mechanics; Thermodynamics

3rd Condensed Matter Physics; Astrophysics; Special and General Relativity

2000-2002 University of Tennessee: Teaching Assistant,
Gave classes on theoretical aspects of a subject; ran practical labs based on that theory. Set and marked mid-term and final exams.
Courses: Third-year undergraduate electromagnetism, Astronomy (course meeting science requirements for non-science students):

Science Education

2014-present Co-created Learning Assistant program in Integrated Science Classes for EC-8 pre-service teachers, and secured internal funding to expand into Calculus-based physics courses PHYS 2425 and PHYS 2426 starting Fall 2015.

2015-present Redeveloped PHYS 2426 (Calculus based physics II - Electricity and Magnetism) as a studio physics class.

2013-present Spearheaded creation of new Master's program for in-service high school physics teachers. Created and taught 3 out of the 6 new core physics classes for this degree, combining advanced physics content with pedagogical activities aimed at engaging high school students in advanced physics concepts. Implementation as a fully online program began in Spring 2015, with one course now being taught fully online.

2013-present Overseen improvements of Integrated Science courses for EC-8 pre-service teachers, including redevelopment of lab manual to align with specific competencies on the TExES certification exam.

2012-present Redeveloping curriculum of undergraduate physics teacher preparation program at Texas A&M University-Commerce, integrating it with departmental objectives of improving recruitment and retention of undergraduate physics students.

2013-2014 Prepared and delivered 4-8 grade science TExES reviews (Texas teacher certification exams).

2013 Served on Educational Testing Center committee to review Texas Education Agency's TExES exam questions.

Supervisory Experience

2012-present Texas A&M University-Commerce:
Supervised 3 REU students; one submitted paper and one published paper have resulted. One REU student presented a poster at the national conference on undergraduate research and gave a talk at the AAAS emerging researchers conference in Washington, DC. The other has presented a talk at the Far West Section of the APS meeting and at the Conference for Undergraduate Women in Physics.

2009-present Texas A&M University-Commerce:
Supervised three Masters students (two graduated) on projects related to symmetry energy effects on neutron star models; four published papers, one submitted paper,a book chapter and two refereed conference proceedings have resulted to date.

2007 University of Oxford:
Co-supervised Master's student on the project "Equation of State of Proto-Neutron Stars."

University Service

2015-present Chair, Physics and Astronomy "Doubling Committee" (charged with implementing activities that will double undergraduate enrollment.)
2015 Chair of Master's thesis committee.
2014-present Advisor for the Society of Physics Students.
2014-present Member of Faculty Senate Curriculum Committee.
2014-present Mentor to new faculty member.
2014-present Advisor for BS and MS in Physics with Teaching Emphasis.
2014 Judge at Spring Celebration of Student Writing Workshop.
2013-2014 Department SACS co-ordinator.
2013-present Served on 5 Faculty Search Committees.
2012-present Member of LeoTeach council (co-ordinating science education activities between science and education departments).

Professional Service

2009-present Referee for Physical Review, Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Journal of Physics, and Nature Physics.
2014 Reviewer for 3 chapters of "Teaching High School Physics" by Carl Wenning and Rebecca Vieyra.
2013 TExES 4-8 Science Test Question reviewer.

Professional Affiliations

American Physical Society
American Astronomical Society
American Association for the Advancement of Science
National Science Teachers Association
American Association of Physics Teachers

Publications

Refereed journal articles

h-index = 12 (refereed publications)

2015 "Observational constraints on neutron star crust-core coupling during glitches",
W. G. Newton, S. Berger and B. Haskell,
MNRAS 454, 4400
arXiv:1506.01445

2015 "Critical Density and Impact of $\Delta(1232)$ Resonance Formation in Neutron Stars",
Bao-Jun Cai, F.J. Fattoyev, Bao-An Li and **W.G. Newton**,
Phys. Rev. C92, 015802
arXiv:1501.01680

2015 "Efficacy of crustal superfluid neutrons in pulsar glitch models",
J. Hooker, **W.G. Newton** and Bao-An Li,
MNRAS 449, 3559
arXiv:1308.0031

2015 "Neutron-proton effective mass splitting in neutron-rich matter at normal density from analyzing nucleon-nucleus scattering data within an isospin dependent optical model",
Xiao-Hua Li, Wen-Jun Guo, Bao-An Li, Lie-Wen Chen, F.J. Fattoyev and **W.G. Newton**
Phys. Lett. B 743, 408
arXiv:1403.5577

2015 "Impact of the equation-of-state-gravity degeneracy on constraining the nuclear symmetry energy from astrophysical observables",
Xiao-Tao He, F.J. Fattoyev, Bao-An Li and **W.G. Newton**,
Phys. Rev. C91, 015810 (2015)
arXiv:1408.0857

2015 "Using neutron star observations to determine crust thicknesses, moments of inertia, and tidal deformabilities",
A.W. Steiner, S. Gandolfi, F.J. Fattoyev and **W.G. Newton**,
Phys. Rev. C91, 015804 (2015)
arXiv:1403.7546

2014 "Phase transitions in core-collapse supernova matter at sub-saturation densities",
Helena Pais, **W.G. Newton** and Jirina R. Stone,
Phys. Rev. C90, 065802 (2014)
arXiv:1411.1885

2014 "Quantifying Correlations Between Isovector Observables and the Density Dependence of Nuclear Symmetry Energy away from Saturation Density",
F.J. Fattoyev, **W.G. Newton** and Bao-An Li,
Phys. Rev. C90, 022801(R) (2014)
arXiv:1405.0750

2014 "Stellar oscillations induced by the passage of a fast stellar object",
C. A. Bertulani, M. Naizer and **W. G.Newton**,
Int. J. Mod. Phys. D23, 10, 1450084 (2014)
arXiv:1405.0764

2014 "Constraints on the symmetry energy from observational probes of the neutron star crust",
W.G. Newton, J. Hooker, M. Gearheart, K. Murphy, De-Hua Wen, F.J. Fattoyev and Bao-An Li,
European Journal of Physics A50, 41

2014 "Probing the high-density behavior of symmetry energy with gravitational waves",
F.J. Fattoyev, **W.G. Newton** and Bao-An Li,
European Journal of Physics A50, 45
arXiv:1309.5153

2013 "The cooling of the Cassiopeia A neutron star as a probe of the nuclear symmetry energy and nuclear pasta",
W.G. Newton, K. Murphy, J. Hooker and Bao-An Li,
ApJ 779, L4
arXiv:1308.2137

2013 "Constraining the High-Density Behavior of Nuclear Symmetry Energy with the Tidal Polarizability of Neutron Stars",
F. Fattoyev, J. Carvajal, **W.G. Newton** and Bao-An Li,
Phys. Rev. C87, 015806
arXiv:1210.3402

2013 "A survey of the parameter space of the compressible liquid drop model as applied to the neutron star inner crust",
W.G. Newton, M. Gearheart, and Bao-An Li,
ApJS 204, 1, 9
arXiv:1110.4043

2012 "Generic constraints on the relativistic mean-field and Skyrme-Hartree-Fock models from the pure neutron matter equation of state",
F. Fattoyev, **W.G. Newton**, Jun Xu and Bao-An Li,
Phys. Rev. C86, 025804
arXiv:1205.0857

2012 "Sensitivity of the neutron star r-mode instability window to the density dependence of the nuclear symmetry energy",
De-Hua Wen, **W.G. Newton**, and Bao-An Li,
Phys. Rev. C85, 025801
arXiv:1110.5985

2011 "Upper limits on the observational effects of nuclear pasta in neutron stars",
M. Gearheart, **W.G. Newton**, J. Hooker and Bao-An Li,
MNRAS 418, 2343
arXiv:1106.4875

2009 "Constraining the gravitational binding energy of PSR J0737-3039B using terrestrial nuclear data",
W.G. Newton and Bao-An Li,
Phys. Rev. C80, 065809
arXiv:0908.1731

2009 "Modeling nuclear "pasta" and the transition to uniform nuclear matter with the 3D Skyrme-Hartree-Fock method at finite temperature: Core-collapse supernovae",
W.G. Newton and J.R. Stone,
Phys. Rev. C79, 055801
arXiv:0904.4714

2005 "The double pulsar J0737-3039: Testing the neutron star equation of state",
Ph. Podsiadlowski,J.D.M. Dewi,P. Lesaffre,J.C. Miller,**W.G. Newton**,J.R. Stone,
MNRAS 361, 1243
astro-ph/0506566

2004 "Giant resonances from TDHF",
P.D. Stevenson,M.R. Strayer,J. Rikovska-Stone,**W.G. Newton**,
Int. Journ. Mod. Phys. E13, 181,
nucl-th/0310020

Book Chapter

2011 "The nuclear symmetry energy, the inner crust, and global neutron star modeling",
W.G. Newton, M. Gearheart, J. Hooker, Bao-An Li,
In "Neutron Star Crust", edited by C. A. Bertulani and J. Piekarewicz,
Nova Publishing, ISBN: 978-1-62081-960-9,
arXiv:1112.2018

Other scientific articles

2013 "Neutron stars: A taste of pasta?",
W.G. Newton,
News and Views, Nature Physics 9, 396

Selected conference proceedings

2015 "Core-collapse supernova matter: light clusters, pasta phase and phase transitions",
Helena Pais, Silvia Chiacchiera, Fabrizio Grill, Constanca Providencia, Isaac Vidana, Sidney S. Avancini, Debora P. Menezes, **William G. Newton** and Jirina R. Stone
Compact Stars in the QCD Phase Diagram IV
arXiv:1503.08753

2013 "Constraints on the symmetry energy from neutron star observations",
W.G. Newton, M. Gearheart, De-Hua Wen and Bao-An Li
Journal of Physics: Conference Series 420, 012145,
arxiv:1212.4539

2013 "Pure Neutron Matter Constraints and Nuclear Symmetry Energy",
F. Fattoyev, **W.G. Newton**, Jun Xu and Bao-An Li,
Journal of Physics: Conference Series 420, 012108,
arxiv:1209.2718

2013 "Applying the snowplow model for pulsar glitches to constrain nuclear symmetry energy",
J. Hooker, **W.G. Newton**, Bao-An Li
Journal of Physics: Conference Series 420, 012153

2013 "Probing Nuclear Symmetry Energy and its Imprints on Properties of Nuclei, Nuclear Reactions, Neutron Stars and Gravitational Waves",
Bao-An Li, Lie-Wen Chen, F. Fattoyev, **W.G. Newton**, Chang Xu,
Journal of Physics: Conference Series 413, 012021,
arxiv:1212.1178

2011 "Imprints of nuclear symmetry energy on properties of neutron stars",
Bao-An Li, Lie-Wen Chen, M. Gearheart, J. Hooker, Che Ming Ko, P.G. Krastev, Wei-Kang Lin, **W.G. Newton**, De-Hua Wen, Chang Xu and Jun Xu,
INPC2010, July 4-9, 2010, Vancouver, Canada
Journal of Physics: Conference Series 312, 042006,
arxiv:1103.4652

2009 "Modeling nuclear pasta and the phase transition to uniform nuclear matter with the 3D-Skyrme-Hartree-Fock method",
W.G. Newton,
Proceedings of the 5th Facility of Rare Isotope Beams (FRIB) Workshop on Bulk Nuclear Properties, Michigan State University,
AIP Conf. Proc. 1128, 154,
arxiv:0903.1464

2007 "A new study of the transition to uniform nuclear matter in neutron stars and supernovae",
W.G. Newton,
Physics of Particles and Nuclei, 39, 7, 1173,
arXiv:0708.3212

2007 "From microscales to macroscales in 3D: Self-consistent equation of state for supernova and neutron star models",
W.G. Newton, J.R. Stone, and A. Mezzacappa,
Journal of Physics: Conference Series 46, 408,
arXiv:0708.3197

2006 "Sub-nuclear matter in neutron stars and supernovae: nuclear pasta and beyond",
W.G. Newton,
Proceedings of RAGtime 6/7: Workshop on Black Holes and Neutron Stars,
Editors S. Hledk and Z. Stuchlk, Silesian University in Opava, Czech Republic, ISBN 80-7248-334-X, pp.119

Presentations

Invited Talks, Seminars and Colloquia

Dec 2015 "The nuclear symmetry energy and neutron stars"
SINAP-CUSTIPEN Workshop on Clusters and Correlations in Nuclei, Nuclear Reactions and Neutron Stars, Shanghai, China

Jul 2015 "The crust of neutron stars",
Graduate Seminar, University of Melbourne, Melbourne, Australia

Feb 2015 "Into the neutron star mantle: in search of super-condensed matter",
University of Texas at Arlington, TX, USA

Sept 2014 "Into the neutron star mantle: in search of super-condensed matter",
University of Texas at Dallas, TX, USA

Jul 2014 "Symmetry energy constraints from observational signatures of the neutron star crust-core transition",
NuSym14: The 4th International Symposium on the Nuclear Symmetry Energy, Liverpool, UK, July 2014

March 2014 "The physics and observational consequences of the neutron star crust-core boundary layer",
Seminar, Los Alamos National Laboratory, Los Alamos, NM, USA

March 2014 "The material science of the neutron star crust: searching for observational signatures of condensed nuclear matter",
Colloquium, University of Texas San Antonio, San Antonio, TX, USA

Feb 2014 "The physics and observational consequences of the neutron star crust-core boundary layer",
Seminar, National Superconducting Cyclotron Laboratory, Michigan State University, East Lansing, MI, USA

Jun 2013 "The nuclear equation of state: what we can infer from experiments and observation",
The Gordon Research Conference on Nuclear Chemistry,
New London, NH, USA

Oct 2012 "Measuring nuclear interactions at 10^{20} paces",
Seminar, Department of Physics, University of Surrey, UK

Mar 2012 "Measuring nuclear interactions at 10^{20} paces",
Colloquium, Department of Physics and Astronomy, Texas A&M University-Commerce, USA

Oct 2011 "Why do pulsars glitch?",
Colloquium, Department of Physics and Astronomy, Texas A&M University-Commerce, USA

Oct 2011 "How deep does a pulsar crust go? Using terrestrial experiments to explore the outer layers of a neutron star",
Fall Joint Meeting of APS and AAPT and Zone 13 SPS,
Texas A&M University-Commerce, USA.

Jul 2011 "Inner crust composition and transition densities",
INT Program INT-11-2b:Astrophysical transients: multi-messenger probes ofnuclear physics,
Seattle, USA.

Jul 2011 "Nuclear symmetry energy and neutron stars",
Seminar, Quarks and Hadrons Group, University of Maryland, USA.

Jun 2011 "The neutron star inner crust: symmetry energy dependence of observable properties",
NuSYM11: International symposium on nuclear symmetry energy,
Smith College, USA.

Oct 2010 "The physics and observable consequences of neutron star crust-core boundary",
Seminar, Argonne National Laboratory, USA.

Oct 2010 "The physics and observable consequences of neutron star crust-core boundary",
Seminar, Michigan State University, USA.

Apr 2009 "Nuclear pasta and the transition to uniform nuclear matter",
Seminar, Los Alamos National Laboratory, USA.

Apr 2007 "Complex microscopic structure in neutron stars and supernovae",
Department of Astronomy, University of Central Lancashire, UK

Jan 2007 "Exploring complex microscopic structure in neutron stars and supernovae with 3D Hartree-Fock",
Seminar, Institut de Physique Nuclaire d′Orsay, Paris, France.

Feb 2006 "Complex fluids in a neutron star inner crust",
Seminar, Department of Applied Mathematics, University of Southampton, UK.

Selected Conference Talks

Oct 2015 "Developing Online Master's Courses for Physics Teachers",
Texas Section of the American Physical Society and the American Association of Physics Teachers,
Baylor, TX

Jul 2015 "The neutron star radius and the crust-core boundary",
The neutron star radius and all that jazz,
McGill University, Montreal, Canada

Aug 2014 Community submission to Neutron Star and Dense Matter Working Group,
Joint DNP Town Meetings on Nuclear Structure and Nuclear Astrophysics,
Texas A&M University, College Station, TX

Dec 2013 "The cooling of the Cas A neutron star as a probe of the symmetry energy and nuclear pasta", XXVII Texas Symposium on Relativistic Astrophysics, Dallas, TX

Oct 2013 "Tidal interactions during neutron star mergers: equation of state considerations",
Joint Fall 2013 Meeting of the Texas Sections of the APS, AAPT, and Zone 13 of the SPS, Brownsville, TX

Aug 2013 "Pulsar glitches from a nuclear physics perspective",
International Workshop on Nuclear Dynamics and Thermodynamics, Texas A&M University, College Station, TX, USA

Jul 2013 "Constraining the High-Density Behavior of Nuclear Symmetry Energy with the Tidal Polarizability of Neutron Stars",
NuSym 2013, Michigan State University, East Lansing, MI, USA

May 2013 "Inferring nuclear matter properties from observations of dynamical neutron star phenomena",
NS2013, Amsterdam, Netherlands

June 2012 "Symmetry energy aspects of neutron star modeling",
Compstar 2012: The physics and astrophysics of compact stars
Tahiti, French Polynesia

May 2012 "Combining terrestrial experiments and neutron star observations to constrain the equation of state of asymmetric nuclear matter",
NN2012, San Antonio, Texas, USA

May 2011 "The neutron star inner crust: upper limits on the observational consequences of nuclear pasta",
Compstar 2011: Gravitational waves and electromagnetic radiation from compact stars,
INFN Catania, Italy.

Aug 2010 "Constraining the gravitational binding energy of PSR J0737-3039B",
Pan American Study Institute on the physics and astrophysics of rare isotopes,
Joao Pessoa, Brazil.

Feb 2009 "Modeling nuclear pasta and the phase transition to uniform matter with Skyrme-Hartree-Fock",
Compstar 2009: The crust of compact stars and beyond,
Universidade de Coimbra, Portugal.

Nov 2008 "Modeling nuclear pasta with Skyrme-Hartree-Fock",
5th FRIB workshop on bulk nuclear properties,
Michigan State University, USA.

Feb 2008 "The transition from homogeneous to inhomogeneous matter in the neutron star crust",
Compstar 2008: The complex physics of neutron stars,
Ladek Zdroj, Portugal.

Sept 2006 "Matter at sub-nuclear densities and the inner crust of neutron stars",
Understanding neutron stars workshop,
University of Alicante, Spain.

Aug 2006 "Sub-nuclear matter in neutron stars and supernovae",
Helmholtz International Summer School: Dense matter in heavy ion collisions and astrophysics,
Dubna, Russia.

Jan 2006 "Sub-nuclear matter in core collapse supernovae",
Workshop on supernovae,
International School for Advanced Studies (SISSA), Trieste, Italy.

Sept 2005 "The structure of the neutron star inner crust",
RAGtime 7: Workshop on black holes and neutron stars,
Opava, Czech Republic.

Aug 2004 "Self-consistent equation of state for hot, dense matter",
Symposium on nuclear equation of state used in astrophysics models,
Philadelphia, Pennsylvania, USA.

Other Positions Held

2004-2007 Visiting Student Junior Advisor, St. Edmund Hall, University of Oxford:
Organised welcome and social events for students visiting from abroad; responsible for students welfare during the first few weeks of their visit.

2003-2004 Cover Dean, St. Edmund Hall, University of Oxford:
Responsible for student discipline and welfare on college site.