

CHAMEL Nicolas

Born on April, 13th 1978 in Saint Martin d'Hères (France).

Institute of Astronomy and Astrophysics
Université Libre de Bruxelles
CP226
Boulevard du Triomphe
B-1050 Brussels (Belgium)

email : nchamel@ulb.ac.be
phone : 00 32 2 650 35 72
<http://www.astro.ulb.ac.be/~chamel/>

Current position

Research associate since January 2008. Member of the Alumni college of the Royal Academy of Belgium since December 2008. Member of the International Astronomical Union since August 2009.

Research topic :

Development of nuclear energy density functionals and their application to supernova cores and neutron stars, superfluid hydrodynamics in compact stars.

Education

★ PhD in Theoretical Physics (with honors)

2001-2004

University Pierre and Marie Curie, Paris VI (France).

Topic : Entrainment in neutron star crust.

Supervisor : Brandon Carter.

Place : Laboratory of the Universe and its Theories, Paris-Meudon Observatory.

★ Master's degree in Theoretical Physics (with honors, rank 5/22, grade average 14.90/20)

2000-2001

Ecole Normale Supérieure, Paris (France).

★ Undergraduate Studies

1999-2000

(with honors, GPA 3.933) University of California, San Diego (USA).

1996-1999

(with honors, rank 1/429, grade average 17.354/20) University Joseph Fourier, Grenoble (France).

Languages

French : mother tongue.

English : read, written and spoken (one year spent in California).

Polish : spoken (one year spent in Poland).

Scholar bases in German.

Teaching

Teaching Assistant at the University Denis Diderot, Paris (France) in 2001-2004.

Post-docs

Place : Institute of Astronomy and Astrophysics, Université Libre de Bruxelles (Belgium).

Duration : 15/1/2006-15/1/2008.

Research project : superfluidity in neutron star crusts.

Supervisor : Stéphane Goriely.

Contract : Marie Curie Intra-European grant from the European Commission.

Place : Copernicus Astronomical Center, Polish Academy of Sciences, Warsaw (Poland).

Duration : 1/10/2004-1/1/2006.

Research project : effective nucleon masses and entrainment effects in the superfluid cores of neutron stars.

Supervisor : Pawel Haensel.

Contract : Lavoisier grant from the French Ministry of Foreign Affairs

Recent scientific communications

Oral presentations at international conferences :

- Gordon Research Conference, New London, New Hampshire (USA), 12-17 June 2011.
- INT Workshop : fermions from cold atoms to neutron stars, Seattle, Washington (USA), 7-15 May 2011.
- CoConut meeting 2010, Valencia, Spain, 15-17 September 2010.
- Astrophysics of Neutron Stars 2010 in honor of Ali Alpar, Izmir, Turkey, 2-6 August 2010.
- European Science Foundation CompStar workshop 2010, Neutron star physics and nuclear physics, Caen, France, 8-16 February 2010.
- International workshop on The Lead Radius Experiment and Neutron Rich Matter in Astrophysics and in the Laboratory, European Center for Theoretical Studies in nuclear physics, Trento, Italy, 3-7 August 2009.
- XXVIIIth International Workshop on Nuclear Theory, Rila Mountains, Bulgaria, 22-27 June 2009.
- Arctic FIDIPRO-EFES Workshop : Future Prospects of Nuclear Structure Physics, Saariselkä, Finland, 20-24 April 2009
- Second ESF CompStar meeting : the crust of compact stars and beyond, Coimbra, Portugal, 5-13 February 2009
- Fifth International Conference on Exotic Nuclei and Atomic Masses, Ryn, Poland, 7-13 September 2008

Lectures at scientific schools

- 7th Russbach Workshop on Nuclear Astrophysics, Russbach am Pass, Gschütt, Austria, 14-20 March 2010.

Seminars :

- Neutron stars : the densest states of condensed matter, Bulgarian Academy of Sciences, Sofia (Bulgaria), 24 August 2011.
- Neutron stars : the densest states of condensed matter, Laboratoire National des Champs Magnétiques Intenses, Toulouse (France), 15 April 2011.
- A historical perspective on the discovery of neutron stars, Institute of Nuclear Physics, Orsay, France, 28 June 2010.
- Hartree-Fock-Bogoliubov atomic mass models and applications to neutron stars, Institute of Nuclear Physics, Orsay, France, 28 April 2010.
- Superfluid models of neutron stars, University of Tuebingen, Germany, 16-17 April 2010.
- From atomic nuclei to neutron star crusts, Copernicus Astronomical Center, Polish Academy of Sciences, Warsaw, Poland, 18 March 2009.

Scientific Distinctions

- ★ Laureate of the Adolphe Wetrems Prize in Physics and Mathematics from the Royal Academy of Sciences, Humanities and Fine Arts of Belgium, 2011
- ★ Selected for Marquis Who's Who in Science and Engineering (USA), 2008-2009
- ★ Selected as "2000 outstanding scientists 2008-2009", "International Top 100 scientists 2008", "Foremost Scientist of the World 2008", "Leading scientists of the world 2008" by the International Biographical Centre, Cambridge (England), 2008.
- ★ Laureate of the National Contest on the French Resistance and Deportation, 1996.

Main scientific collaborations

University of Montreal (Canada), Institute of Nuclear Physics in Orsay (France), Los Alamos National Laboratory (USA), Niels Bohr Institute (Denmark), Institute of Nuclear Research and Nuclear Energy from the Bulgarian Academy of Sciences, Copernicus Astronomical Center from the Polish Academy of Sciences, Paris-Meudon Observatory (France).

Refereeing

Member of the Nuclear Astrophysics working group involved in the writing of 2010 Long Range Plan for Nuclear Physics report published by the Nuclear Physics European Collaboration Committee (NUPECC) .

Referee for Physical Review Letters, Physical Review C, Physical Review D, Nuclear Physics A, Journal of Physics G, Astrophysics and Space Science, The Astrophysical Journal, Classical and Quantum Gravity, Living Review in Relativity, Monthly Notices of the Royal Astronomical Society, Proceedings A of the Royal Society, Physica A, International Journal of Modern Physics D.

List of publications

Peer reviewed articles

1. B. Carter, N. Chamel
Covariant analysis of Newtonian multi-fluid models for neutron stars : I Milne-Cartan structure and variational formulation
International Journal of Modern Physics D **13** (2004) 291-325.
2. B. Carter, N. Chamel & P. Haensel
Entrainment coefficient and effective mass for conduction neutrons in neutron star crust : simple microscopic models
Nuclear Physics A **748** (2005) 675-697.
3. N. Chamel
Band structure effects for dripped neutrons in neutron star crust
Nuclear Physics A **747** (2005) 109-128.
4. B. Carter & N. Chamel
Covariant analysis of Newtonian multi-fluid models for neutron stars : II Stress - energy tensors and virial theorems,
International Journal of Modern Physics D **14** (2005) 717-748.

5. B. Carter, N. Chamel & P. Haensel
Effects of BCS pairing on entrainment in neutron superfluid current in neutron star crust
Nuclear Physics A **759** (2005) 441-464.
6. B. Carter & N. Chamel
Covariant analysis of Newtonian multi-fluid models for neutron stars : III Transvective, viscous, and superfluid drag dissipation
International Journal of Modern Physics D **14** (2005) 717-748.
7. B. Carter, E. Chachoua & N. Chamel
Covariant analysis of Newtonian solid models for neutron stars : I simple (magneto-) elastic case
General Relativity and Gravitation **38** (2006) 83-119.
8. B. Carter, N. Chamel & P. Haensel
Entrainment coefficient and effective mass for conduction neutrons in neutron star crust : macroscopic treatment
International Journal of Modern Physics D **15** (2006) 777-803.
9. N. Chamel & B. Carter
Effect of entrainment on strain in stratified neutron star crust and pulsar glitches
Monthly Notices of the Royal Astronomical Society **368** (2006) 796-808.
10. N. Chamel
Effective mass of free neutrons in neutron star crust
Nuclear Physics A **773** (2006) 263-278.
11. N. Chamel & P. Haensel
Entrainment parameters in cold neutron star core
Physical Review C **73** (2006) 045802.
12. N. Chamel, S. Naimi, E. Khan, J. Margueron
Validity of the Wigner-Seitz approximation in neutron star crust
Physical Review C **75** (2007) 055806.
13. N. Chamel
Two-fluid models of superfluid neutron star cores
Monthly Notices of the Royal Astronomical Society **388** (2008), 737-752.
14. N. Chamel & P. Haensel
Physics of neutron star crusts
Living Reviews in Relativity **11** (2008), 10.
<http://www.livingreviews.org/lrr-2008-10>
15. M. Onsi, A. K. Dutta, H. Chatri, S. Goriely, N. Chamel, J. M. Pearson
Semi-classical equation of state and specific heats for neutron-star inner crust with proton shell corrections
Physical Review C **77** (2008), 065805.
16. N. Chamel, S. Goriely, J. M. Pearson
Further explorations of Skyrme-Hartree-Fock-Bogoliubov mass formulas. IX : Constraint of pairing force to 1S_0 neutron-matter gap
Nuclear Physics A **812** (2008), 72-98.
17. N. Chamel, J. Margueron, E. Khan
Neutron specific heat in the crust of neutron stars from the nuclear band theory
Physical Review C **79** (2009), 012801 (R).

18. S. Goriely, N. Chamel, J. M. Pearson
Skyrme-Hartree-Fock-Bogoliubov Nuclear Mass Formulas : Crossing the 0.6 MeV Accuracy Threshold with Microscopically Deduced Pairing
Physical Review Letters **102** (2009), 152503.
19. S. Goriely, N. Chamel, J. M. Pearson
Recent breakthroughs in Skyrme-Hartree-Fock-Bogoliubov mass formulas
The European Physical Journal A **42** (2009), 547-552.
20. N. Chamel, S. Goriely, J. M. Pearson
Further explorations of Skyrme-Hartree-Fock-Bogoliubov mass formulas. XI. Stabilizing neutron stars against a ferromagnetic collapse
Physical Review C **80** (2009), 065804.
21. N. Chamel, S. Goriely, J. M. Pearson, M. Onsi
Unified description of neutron superfluidity in the neutron-star crust with analogy to anisotropic multi-band BCS superconductors
Physical Review C **81** (2010), 045804.
22. N. Chamel,
Effective contact pairing forces from realistic calculations in infinite homogeneous nuclear matter
Physical Review C **82** (2010), 014313.
23. S. Goriely, J.M. Pearson, N. Chamel,
Further explorations of Skyrme-Hartree-Fock-Bogoliubov mass formulas. XII. Stiffness and stability of neutron-star matter
Physical Review C **82** (2010), 035804.
24. J.M. Pearson, N. Chamel, S. Goriely,
Breathing-mode measurements in Sn isotopes and isospin dependence of nuclear incompressibility
Physical Review C **82** (2010), 037301.
25. N. Chamel, S. Goriely,
Spin and spin-isospin instabilities in asymmetric nuclear matter at zero and finite temperatures using Skyrme functionals
Physical Review C **82** (2010), 045804.
26. N. Chamel,
Self-interaction errors in nuclear energy density functionals
Physical Review C **82** (2010), 061307 (R).
27. J.M. Pearson, S. Goriely, N. Chamel,
Properties of the outer crust of neutron stars from Hartree-Fock-Bogoliubov mass models
Physical Review C **83** (2011), 065810.
28. S. Goriely, N. Chamel, H.T. Janka, J. M. Pearson
The decompression of the outer neutron star crust and r-process nucleosynthesis
Astronomy & Astrophysics **531** (2011), A78.

Conference Proceedings

1. N. Chamel
The crust of neutron stars
Tours Symposium on Nuclear Physics VI, American Institute of Physics Conference Series **891** (2007) 382-390.

2. N. Chamel
Neutron star crust beyond the Wigner-Seitz approximation
Exotic states of nuclear matter, Proceedings of the International Symposium EXOCT07, edited by U. Lombardo, M. Baldo, F. Burgio and H.J. Schulze, World Scientific Publishing (2008) 91-98.
3. S. Goriely, S. Hilaire, N. Chamel
Nuclear inputs for nucleosynthesis applications
Proceedings of the 13th International Symposium on Capture Gamma-Ray Spectroscopy and Related Topics, American Institute of Physics Conference Series **1090** (2009), 33-40.
4. J. M. Pearson, S. Goriely, N. Chamel, M. Samyn, N. Onsi
Hartree-Fock-Bogoliubov Mass Models and the Equation of State of Neutron-Star Crusts
Proceedings of the 5th ANL/MSU/JINA/INT FRIB Workshop, American Institute of Physics Conference Series **1128** (2009), 29-39.
5. E. Minaya Ramirez, G. Audi, D. Beck, K. Blaum, K., Ch. Böhm, C. Borgmann, M. Breitenfeldt, N. Chamel, S. George, S. Goriely, F. Herfurth, A. Herlert, A. Kellerbauer, M. Kowalska, D. Lunney, S. Naimi, D. Neidherr, J. M. Pearson, M. Rosenbusch, S. Schwarz, L. Schweikhard
Neutron drip-line topography
Proceedings of the international conference on Nuclear structure and dynamics, American Institute of Physics Conference Series **1165** (2009), 94-97.
6. N. Chamel, S. Goriely, J.M. Pearson,
The Skyrme-Hartree-Fock-Bogoliubov method : its application to finite nuclei and neutron-star crusts
Proceedings of the XXVIIIth International Workshop on Nuclear Theory, Rila Mountains, Bulgaria, 22-27 June 2009, pp247-253.
7. C.J. Pethick, N. Chamel, S. Reddy,
Superfluid Dynamics in Neutron Star Crusts
Proceedings of the Yukawa Institute for Theoretical Physics international workshop New Frontiers in QCD 2010 - Exotic Hadron Systems and Dense Matter, 18 January-19 March 2010, Kyoto, Japan. Progress of Theoretical Physics Supplement **186** (2010), 9-16.
8. R. L. Pavlov, L. M. Mihailov, Ch. J. Velchev, M. Dimitrova-Ivanovich, Zh. K. Stoyanov, N. Chamel,
Contributions of Electron-Electron and Electron-Nucleus Correlations In Nonrelativistic and Relativistic Ground State Energies of Low and Multiply Charged Helium Like Ions with Charge from Z=2 to Z=118
Proceedings of the XXIXth International Workshop on Nuclear Theory, 21-26 June 2010, Rila Mountains, Bulgaria. A paraître.
9. N. Chamel, S. Goriely, J.M. Pearson,
Generalized equation of state for cold superfluid neutron stars
Proceedings of the international conference Astrophysics of Neutron Stars - 2010 in honor of M. Ali Alpar, Izmir, Turkey, 2-6 August 2010. A paraître dans AIP Conference Proceedings Series.
10. S. Goriely, N. Chamel, J.M. Pearson,
The r-process nucleosynthesis during the decompression of neutronised matter
Proceedings of the 3rd international conference Frontiers In Nuclear Structure, Astrophysics and Reactions (FINUSTAR 3), Rhodos, Greece, 23- 27 August 2010. A paraître dans AIP Conference Proceedings Series.
11. R. Pavlov, L. Mihailov, Ch. Velchev, M. Dimitrova-Ivanovich, Zh. Stoyanov, N. Chamel, J. Maruani,
Effects induced by nuclear deformations and electron correlations on the ground-state energy of low and multiply charged helium like ions in high-temperature plasmas
Proceedings of the 16th International School on Condensed Matter Physics, Varna, Bulgaria, 29 August-3 September 2010. Journal of Physics : Conference Series **253** (2010), 012075.