

CURRICULUM VITAE

Christian MINIATURA

Research Director at CNRS (DR1),

Director of MajuLab,

CNRS-UCA-SU-NUS-NTU International Joint Research Unit, UMI 3654, Singapore.

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Researcher ID: E-2882-2016

A. EDUCATIONAL QUALIFICATIONS

- 1981-1986** Alumni ENS Cachan. Master of Physics, French Agrégation de Physique and Diplôme d'Etudes Approfondies (equivalent of first year PhD in Singapore).
- 1987-1990** PhD in Physics at Laser Physics Lab, University Paris 13, (supervisor Professor J. Baudon).
Title: *Production and analysis of a beam of metastable Hydrogen atoms. Study of the collision $H(D)^* - H_2(D_2)(X^1\Sigma_g^+, v=0)$ at thermal energies* (in French)
- 2001** French Habilitation, University of Nice.
Title: *Interference: from waves to disorder* (in French)

B. PROFESSIONAL EXPERIENCE

- Appointments¹

- 1989-1993** Research Associate (rank 2) at Centre National de la Recherche Scientifique (CNRS), affiliated at Laser Physics Lab (University Paris 13)
- 1993-1997** Research Associate (rank 1) at CNRS, affiliated at Laser Physics Lab (University Paris 13)
- 1997-2005** Research Associate (rank 1) at CNRS, affiliated at Nonlinear Institute of Nice (INLN), University of Nice
- 2005-2013** Research Director (rank 2) at CNRS, affiliated at Nonlinear Institute of Nice (INLN), University of Nice
- Director of International Joint Lab "France Singapore Quantum Physics and Information Lab" (2010-2013)

¹ In the French system, Research Associate 2 would correspond to an Assistant-Prof on tenure track, Research Associate 1 to a tenured Associate-Prof, Research Director 1 and 2 would correspond to Full Prof.

2014- Research Director (rank 2) at CNRS, affiliated at MajuLab, CNRS-UNS-NUS-NTU International Joint Research Unit, UMI 3654, Singapore

Director of MajuLab
<http://majulab.cnrs.fr/>

Promoted Research Director rank 1 in Feb 2017.

- Visiting Positions

2005-2007 Visiting Research Professor at Physics Department, Faculty of Science, NUS, Singapore

2008- Visiting Research Professor at Centre for Quantum Technologies and Physics Department, Faculty of Science, NUS, Singapore
http://www.quantumlah.org/people/c_miniatura
<http://www.physics.nus.edu.sg/staff/miniatura.html>

2016- Visiting Professor at PAP, SPMS, NTU, Singapore
<http://www.spms.ntu.edu.sg/pap/Home/Faculty/Miniature%20Christin.html>

2019- Visiting Professor at Science Division, Yale-NUS, Singapore

- Honors and Awards

1994 CNRS Young Researcher award (aka Bronze Medal) for the work on atomic interferometry

2009 Fellow of the Institute of Advanced Studies (IAS), NTU, Singapore

C. PUBLICATIONS

- H-index **27**

(Source: *Web of Science* 25 Jan 2020)

- Total number of publications **117**

(comprising **89** publications in refereed journals, **6** publications in refereed proceedings, **3** book chapters, **2** memoirs, **6** non-refereed proceedings, **6** popular articles and **5** arXiv).

- Total number of citations **2209**

(Source: *Web of Science* 25 Jan 2020)

- Invited/contributed talks **31**

- Seminars **53**

- Books (co-edition) **2**

D. RESEARCH FOCUS

Key words: Ultracold matter, Quantum transport, Strongly-correlated systems

From 2004 onwards, my theoretical research interests have mainly focused on quantum transport and strongly-correlated systems from a quantum gases perspective. Indeed, the remarkable degree of control and precision achieved nowadays by experiments using ultracold quantum gases (Bose condensates, degenerate Fermi gas) has allowed the systematic study of effects previously observed and studied in condensed matter. Paradigmatic examples are temperature-driven and quantum phase transitions (Mott-Hubbard, Kosterlitz-Thouless), graphene physics, artificial gauge fields and Anderson localization.

For more details, see

<http://www.spms.ntu.edu.sg/pap/Home/Faculty/Miniature%20Christin.html>

E. SELECTED PUBLICATIONS

Coherent Backscattering of light by cold atoms

G. Labeyrie, F. de Tomasi, C. Müller, J.-C. Bernard, Ch. Miniatura and R. Kaiser
Phys. Rev. Lett. **83**, 5266 (1999)

This is my most cited paper (253 citations)

Coherent forward scattering peak induced by Anderson localization

T. Karpiuk, N. Cherroret, K. L. Lee, B. Grémaud, C. A. Müller, and C. Miniatura
Phys. Rev. Lett. **109**, 190601 (2012)

This paper reports the discovery of a new interference effect

Non-Abelian adiabatic geometric transformations in a cold Strontium gas

F. Leroux, K. Pandey, R. Rebhi, F. Chevy, C. Miniatura, B. Grémaud, and D. Wilkowski
Nature Communications **9**, 3580 (2018)

Tan's contact scaling behavior for trapped Lieb-Liniger bosons: from two to many

M. Rizzi, C. Miniatura, A. Minguzzi, and P. Vignolo
Phys. Rev. A **98**, 043607 (2018)

Editor's Choice

Triangular and honeycomb lattices of cold atoms in optical cavities

S. Safaei, C. Miniatura, and B. Grémaud
Phys. Rev. A **92**, 043810 (2015).

U(3) artificial gauge fields for cold atoms

Y.-X. Hu, Ch. Miniatura, D. Wilkowski, and B. Grémaud
Phys. Rev. A **90**, 023601 (2014)

Topological quantum phase transitions of attractive spinless fermions in a honeycomb lattice

D. Poletti, C. Miniatura and B. Grémaud
Europhys. Lett. **93**, 37008 (2011)

Ultracold Fermions in a Graphene-Type Optical Lattice

K. L. Lee, B. Grémaud, R. Han, B.-G. Englert, C. Miniatura

Phys. Rev. A **80**, 043411 (2009)

This paper has been highlighted by APS

Fermionization of a strongly interacting Bose-Fermi mixture in a one-dimensional harmonic trap

B. Fang, P. Vignolo, C. Miniatura, A. Minguzzi

Phys. Rev. A **79**, 023623 (2009)

Atomic interferences and the topological phase

Ch. Miniatura, J. Robert, O. Gorceix, V. Lorent, S. Le Boiteux, J. Reinhardt and J. Baudon

Phys. Rev. Lett. **69**, 261 (1992)

Light scarring in an optical fiber

V. Doya, O. Legrand, F. Mortessagne and Ch. Miniatura

Phys. Rev. Lett. **88**, 014102-1 (2002)

Localization of Matter Waves in 2D-Disordered Optical Potentials

R. C. Kuhn, C. Miniatura, D. Delande, O. Sigwarth, C. A. Mueller

Phys. Rev. Lett. **95**, 250403 (2005)

Multiple scattering of light by atoms with internal degeneracy

C. A. Müller and C. Miniatura

J. Phys. A: Math. Gen. **35**, 10163 (2002)

F. SELECTED TALKS (since 2008)

Ultracold fermions in a graphene-like optical lattice

“New Frontiers in Graphene Physics” workshop, ECT*, 12-14 April 2010, Trento (Italy).

Coherent transport of matter waves: Anderson localization and coherent backscattering

National Institute of Informatics, Tokyo, Japon, 21/2/12

Coherent forward multiple scattering of waves in the Anderson localization regime

Atominstitut, Technische Universitaet Wien, Vienne (Autriche), 28/06/13

A Twin Peaks tale : Coherent forward scattering peak induced by Anderson localization

Quantum Optics VIII, 26 May – 01 June 2013, Jachranka near Warsaw (Poland).

Momentum signatures of Anderson localization

Summer school "Waves and disorder", 30 June – 12 July 2014, Cargèse, Corsica (France).

Matter waves in disordered potentials : from localization to thermalization and condensation

Extreme Events in Complex Optical Systems, EECOS 2015, 01-04 December 2015, Buenos Aires (Argentina).

Matter waves in disordered potentials : from localization to thermalization and condensation

Nice Optics 2016, 1st International Conference on Optics, Photonics and Materials, 26-28 October 2016, Nice (France). **Keynote speech.**

Non-Abelian adiabatic geometric transformations in a cold Strontium gas

Advances in Quantum Engineering, AQE2019, 24-26 June 2019, Shenzhen (China).

Critical properties of the Anderson transition through the looking-glass of the CBS and CFS peaks.

Zhong Guan Cun Forum on Condensed Matter Physics, IoP, CAS, Beijing, China, 01/07/19

G. LIST OF RECENT COLLABORATORS

Dominique Delande (Laboratoire Kastler-Brossel, Paris, France)

George Batrouni (InPhyNi, Nice, France)

Nicolas Cherroret (Laboratoire Kastler-Brossel, Paris, France)

Patrizia Vignolo (InPhyNi, Nice, France)

Luigi Amico (University of Catania, Italie)

David Wilkowski (PAP, SPMS, NTU)

Rainer Dumke (PAP, SPMS, NTU)

Kwek Leong Chuan (CQT, NUS and NIE, NTU)

Gabriel Lemarié (LPT, Toulouse, France)

H. LIST OF ADVISEES (INCLUDING STUDENTS MENTORED) FROM 2004

Postdoctoral and Research Assistants: 9

Fang Yiyuan Bess (2008-2010), *Strongly interacting Bose-Fermi mixtures*

Poletti Dario (2009-2010), *Topological quantum phase transitions*

Karpiuk Tomasz (2009-2011), *Quantum transport and superfluidity*

Gorecka Agnieszka (2010-2012), *Artificial gauge fields*

Gawriluk Krzysztof (2011-2013), *Mott-Insulator phases*

Li Yun (2013-2014), *Interacting bosons in a honeycomb lattice*

Safaei Shabnam (2013-), *Self-organization, Atomtronics*

Nguyen Thi Phuc Tan (2014-2015), *Motional effects in multiple scattering of light*

Kho Zhe Wei, *Improved Gutzwiller ansatz for interacting bosons in optical lattices*

Jean Decamp (2019-2021), *Strongly correlated quantum systems*

Doctoral Students: 9

Kuhn Robert (2004-2007), *Coherent transport of matter waves in disordered optical potentials*

Koong Chee Weng (2005-2010), *Spin-orbit interaction induced spin separation in platinum nanostructures*

Lee Kean Loon (2008-2010), *Ultracold fermions in a honeycomb optical lattice*

Wang Guangquan (2008-2011), *Strongly correlated phases in the anisotropic honeycomb lattice*

Wolak Marta (2008-2011), Quantum Monte Carlo studies of the population imbalanced Fermi Gas

Lu Yin (2009-2012), *Light scattering of atoms with internal degeneracy*

Hu Yu-Xin (2011-2015), *Artificial gauge fields and topological effects in quantum gases*

Ghosh Sanjib (2013-2017), *Momentum signatures of Anderson localization*

Bornheimer Ulrike (2015-2020) *Synthetic non-Abelian gauge fields for quantum gases*

Undergraduate Students and Interns (2006-): 9

Lu Yin (NUS), *Case Study of Transport Through Random Media*
Wang Guangquan (NUS), *Quantitative wave-particle duality in double scattering of light by two distant spin 1/2 atoms*
Han Rui (NUS), *Ultracold atoms in a honeycomb optical lattice*
Tan Hwai Yik Marcus (NUS), *Construction of Wannier functions in a 1D double well lattice*
Wong Yuan Keng Alex (NUS), *Chaotic dynamics in a honeycomb potential*
Ye Yong'En Joash (NUS), *Quantum Hall effect and disorder: topological properties*
Kho Zhe Wei, and Jung Shaun, and Quek Sylvanus (NUS), *Critical behavior and phase transitions in Hubbard models*
Szenicer Alexandre (ENS Paris Scalay), *Improved Gutzwiller ansatz for interacting bosons in optical lattices*
Tay Daniel (NUS), *Disordered Magnetic Systems: Theory and Simulation*

I. SERVICE (since 2005)

Elected board member of the Atomic and Molecular Physics and Optics division of the French Physical Society (SFP) since 2005

Fellow of the Institute of Advanced Studies (IAS), NTU, Singapore since 2009

Life Member of IPS, Singapore, since 2009

Referee à Physical Review Letters, Physical Review A, etc

Organisation of conferences, workshops, etc:

Member of the Organizing Committee of the 37th International Physics Olympiads (Singapore, 8-17 July 2006), responsible for the writing of theory problems.

Organization of the first session abroad of a summer school in Les Houches (29 June - 24 July), <http://www.ntu.edu.sg/ias/upcomingevents/LHSOPS09/Pages/default.aspx>

Member of the Organizing Committee of the Workshop on Physics with Ultra Cold Atoms, 21 July 2010, IAS, NTU (Singapore)
<http://www.ntu.edu.sg/ias/upcomingevents/UltraColdAtoms/Pages/default.aspx>

Co-organizer of the 1st bilateral conference between the French Society of Physics and the Institute of Physics Singapore, "Condensed-matter and quantum information physics: shedding new light with atomic systems", 16-19 January 2012.
<http://www.ntu.edu.sg/ias/upcomingevents/IPS2012/Pages/HomePage.aspx>

Co-organization of the Collège de France abroad lectures of Serge Haroche (Singapore, February 2012).

Scientific Director of the session "Strong Light-Matter coupling: from atoms to solid-state systems", 21 May - 8 June 2012, IAS, NTU (Singapore).
<http://www.ntu.edu.sg/ias/upcomingevents/SSOP12/Pages/default.aspx>

Organizer of the "SU(N), Gauge Fields and Cold Atoms" workshop, 18-20 Jan 2016 (CQT, NUS, Singapore), <http://majulab.cnrs.fr/spip.php?rubrique44>

Co-organizer of the QuESTS symposium on quantum technologies, 14-18 Nov 2016, (NUS, Singapore), <http://merlionquests.neel.cnrs.fr/>

In preparation: Workshop QuanTech on innovative aspects of quantum technologies (2019). Application to the Merlion Call (2018).

In preparation: Atomtronics Workshop, 07-20 May 2019, Benasque (Spain). <http://benasque.org/general/cgi-bin/years.pl?ano=2019>

Co-organization of a joint conference between NTU and UCA (18-20 June 2018) for the kick-off meeting the UMI mirror site in Nice (with David Wilkowski). <http://inphyni.cnrs.fr/sites/conferences/pqn-nice-2018/>

QuEST School on Quantum Technologies with Light, 8-13 Jan 2018, NTU, Singapore <http://majulab.cnrs.fr/spip.php?article171>

Co-organization (and sponsoring) of the Atomtronics Workshop, 07-20 May 2019, Benasque (Spain), 2 PAP speakers, <http://benasque.org/2019atomtronics/>.

J. TEACHING IN SINGAPORE

1) NUS

- AY 2005/2006 (Semesters 1 & 2): 192h

Undergraduate level, Double Degree program NUS-French Grandes Ecoles (FDDP):

- 4h weekly lectures (2h of Physics, 2h of Maths)
- 4h weekly tutorials (2h of Maths, 2h of Physics).

Physics: Electromagnetism (electrostatics, magnetostatics, Maxwell equations in vacuum and material environments).

Mathematics: Analysis (sequence, continuity, derivation, integration, numerical series, series of functions, whole series).

- AY 2006/2007 (Semester 1): 48h

Undergraduate level, Double Degree program NUS-French Grandes Ecoles (FDDP).

Physics: Electrostatic, magnetostatic, Maxwell's equations in vacuum and material media.

- AY 2008/2009 to AYE 2014/2015: 75h / year

Undergraduate level, Double Degree program NUS-French Grandes Ecoles (FDDP).

Physics: Electrostatics, magnetostatics, Maxwell equations in vacuum and material media. Electrostatic, magnetostatic, point and system mechanics, Maxwell equations in vacuum and material media.

- AY 2015/2016 to AY 2018/2019 (Semester 2): 26h / semester

Freshman Module Seminar FMS1212P: introduction to complex systems (disorder, chaos, scale invariance, etc.).

2) Yale-NUS

- AY 2017/2018 (Semester1) : 78h / semester

YSC3211 Introduction to Electrodynamics

- **AY 2019/2020 (Semester 1): 65h / semester**

YNC-2019SI2 Scientific Inquiry 2

3) NTU

- **AY 2016/2017 to AY 2019/2020 (Semester 1): about 12h per year**

Participation to the Module PAP738 "Advanced Topics in Physics: Atoms and photons: from principles to applications " (Coordinator A-Prof. David Wilkowski) at Nanyang Technological University (NTU) under the form of lectures, tutorials and Journal Club on "Particle and Wave transport in random media".