

Gael Reinaudi

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Cold Atoms Group in the Columbia University (New York)

Education

- 2004-2008**
- **Ph.D. in the Laboratoire Kastler-Brossel, École Normale Supérieure de Paris (ENS Ulm)**
Atom Optics Group led by Claude Cohen-Tannoudji (Nobel Laureate)
Ph.D. thesis published as a book sold on amazon.com (see publications)
- 2001-2005**
- **Admission through competitive exams, and studies at the École Normale Supérieure in Paris :**
 - ◊ Master degree in quantum physics
 - ◊ 3 months theoretical study in the *Quantum fluid group* of the LKB (ENS, Paris)
 - ◊ 7 months experimental study in the Quantum Optics Laboratory (Humboldt Univ, Berlin)
 - ◊ 1 month experimental study in the Blackett Laboratory (Imperial College, London)

Skills

Research :

- Quantum atom optics (interaction between light and ultracold atoms),
- Design and setup of various lasers, optics, vacuum systems
- Design of electronics circuits and intuitive user interfaces for controlling experimental setup

Quantitative :

- Numerical methods, probability theory
- Complex, rigorous analysis as well as back-of-the-envelope calculation

Programming :

- C++, data structures, class hierarchy design, design patterns, algorithm development
- Profiler, version control, Visual studio IDE, symbolic manipulation software (Maple)
- Frameworks : Qt, Boost, Wt (C++ web development)
- Numerical libraries : NLOpt, AlgLib, GaLib & Evolving Objects (genetic optimizations)
- Keen interests : genetic algorithms, artificial neural networks
- Agile programming technique, *Lean Startup* paradigm

Professional Experience

Research :

- 2011-2012**
- **Associate Research Scientist in the department of physics at Columbia University (New York)**
Optical Production of Stable Ultracold Sr88 Molecules, resulting in 1 article (see publications)
- 2008-2011**
- **Postdoc in the department of physics at Columbia University (New York)**
Design and setup of the first ultracold atom experiment of the Columbia University
Design of original equipments and software for streamlining the research activity of the lab, resulting in 1 article (see publications)
- 2004-2008**
- **Ph.D. student in the Cold Atoms Group of the Laboratoire Kastler-Brossel (ENS, Paris) :**
Manipulation and evaporative cooling of ultracold atomic packets for the production of a continuous and intense beam in the degenerate regime : towards the "continuous atom laser",
under the direction of David Guéry-Odelin. (group supervised by Jean Dalibard and Nobel Laureate Claude Cohen-Tannoudji), published as a book in 2010 (see publications)
- 2004**
- **Theoretical work in the Quantum fluid Group of the LKB (ENS, Paris) :**
Long-lived quantum memory with nuclear atomic spins at room temperature : transferring the squeezing from a vacuum field to the nuclear spin of ^3He ,
under the direction of Alice Sinatra, resulting in 2 articles (see publications)
- 2003**
- **Experimental work in the Nano-Optics Laboratory of the Humboldt University in Berlin (Germany) :**
Implementation of the BB84 quantum cryptography protocol using a source of single photons,
under the direction of Oliver Benson, (2 articles related, see publications)
- 2002**
- **Experimental work on the Mega Ampere Generator for Plasma Implosion Experiments (MAG-PIE) of the Imperial College (plasma physics group) in London (Great Britain) :**
Implementation of a pulsed gas jet under vacuum in order to study the plasma jet auto-focalisation,
under the direction of Jerry Chittenden

Professional Experience (continued)

Programming a framework for controlling laboratory experiments :

2005-2012

- Project single-handedly designed and coded
Used in Columbia University atom-optics experiments
- Main characteristics and features :
 - ◊ Fully object-oriented, multi-threaded, 30k+ lines
 - ◊ Very graphical and interactive user experience
 - ◊ Plugin enabled : API for integration of user defined components
 - ◊ 30 existing plugins used in atom-optics experiment, including several image processing modules
 - ◊ High degree of modularity and runtime inter-connectivity between components
 - ◊ Interfaces for numerical optimizations (gradient, non-gradient based and genetic)
 - ◊ Interface for image processing and shape fitting
 - ◊ Can be seen on vimeo.com/32183792 and vimeo.com/31039111

Reviewing work :

2006

- Establishing the state of the art in the field of atom-optics and atom lasers for the *Prospective Oriented Group on Lasers and Optronics (POLOQ)* within the French department of defense. Goals : participate in the development of technology roadmaps, analyze scientific and technological advances in optronics, highlight technological breakthroughs. (see publications)

Communications :

2010-2012

2007

2006-2008

2006

2005

- Poster presentations at the annual conference *Division of Atomic, Molecular and Optical Physics*
- Invited speaker at the conference *Quantum Engineering based on Atoms and Photons* in Hannover
- Presentations of results and achievements in internationally recognized groups in Canberra (Australia), Toronto (Canada), Berlin (Germany), Tokyo (Japan).
- Poster presentation at the conference *European-Australian Workshop on Quantum Atom-Optics* in Canberra (Australia)
- Poster presentation at the conference *Quantum Optics* in Les Houches (France)

Teaching :

2006-2008

2004-2005

- Scientific expert guide at the *Palais de la Découverte* (scientific museum) in Paris :
Public demonstrations on physics, and designing of new experiments
- Examiner in preparatory classes for the Grandes Écoles
- Scientific guide in the *Cold Atoms Group* (ENS) for the students from preparatory classes to the Grandes Écoles

Additional information

Languages

Hobbies

- Fluent in French and English, knowledge of German
- Avid rock climber (7.12d), making and flying model airplanes and helicopters, guitar, motorcycling

Publications

- 2012**
- G. Reinaudi, C. B. Osborn, M. McDonald, S. Kotochigova & T. Zelevinsky
Optical Production of Stable Ultracold Sr88 Molecules
Phys. Rev. Lett., **109**, 115303 (2012)
 - G. L. Gattobigio, A. Couvert, G. Reinaudi, B. Georgeot & D. Guéry-Odelin
Optically guided beam splitter for propagating matter waves
Phys. Rev. Lett., **109**, 030403 (2012)
Selected for the *American Physical Society "Spotlighting exceptional research"*
- 2011**
- G. Reinaudi, C. B. Osborn, K. Bega, & T. Zelevinsky
Dynamically configurable and optimizable Zeeman slower using permanent magnets and servomotors
J. Opt. Soc. Am. B, 160242 (2011)
- 2010**
- G. Reinaudi, book publication of the Ph.D. Thesis
Manipulation d'atomes ultra-froids : vers un laser à atomes continu (Manipulation of ultra cold atoms : towards a continuous atom laser)
Editions Universitaires Europeennes, ISBN 978-613-1-50940-7 (2010)
- 2008**
- A. Couvert, M. Jeppesen, T. Kawalec, G. Reinaudi, R. Mathevet, & D. Guéry-Odelin
Quasi-monomode guided atom laser
Eur. Phys. News **39-Highlights**, 6-14 (2008)
 - A. Couvert, M. Jeppesen, T. Kawalec, G. Reinaudi, R. Mathevet, & D. Guéry-Odelin
A quasi-monomode guided atom-laser from an all-optical Bose-Einstein condensate
Europhys. Lett. **83**, 50001 (2008)
Selected for the "**Highlights**" section in Eur. Phys. News **39**
 - G. Reinaudi & D. Guéry-Odelin
A Maxwell's demon in the generation of an intense and slow guided beam
Phys. Rev. A **78**, 015401 (2008)
 - A. Couvert, T. Kawalec, G. Reinaudi & D. Guéry-Odelin
Optimal transport of ultracold atoms in the non-adiabatic regime
Europhys. Lett. **83**, 13001 (2008)
- 2007**
- G. Reinaudi, T. Lahaye, Z. Wang & D. Guéry-Odelin
Strong saturation absorption imaging of dense clouds of ultracold atoms
Opt. Lett. **32**, 3143 (2007)
 - G. Reinaudi, A. Sinatra, A. Dantan & M. Pinard
Squeezing and entangling nuclear spins in ^3He
J. Mod. Opt. **54**, 675-695 (2007)
 - G. Reinaudi, Z. Wang, A. Couvert, T. Lahaye & D. Guéry-Odelin
A mirror to generate a beam
Eur. Phys. News **38-Highlights**, 3-17 (2007)
- 2006**
- G. Reinaudi & D. Guéry-Odelin
The atom lasers
DGA Edition, Bulletin bibliographique Prospective Oriented Group on Lasers and Optronics (POLOQ)
n°2006-1, p. 165-172
 - G. Reinaudi, Z. Wang, A. Couvert, T. Lahaye & D. Guéry-Odelin
A moving magnetic mirror to slow down a bunch of atoms
Eur. Phys. J. D **40**, 405-410 (2006)
Selected for the "**Highlights**" section in Eur. Phys. News **38**
 - T. Lahaye, G. Reinaudi, Z. Wang, A. Couvert & D. Guéry-Odelin
Transport of Atom Packets in a Train of Ioffe-Pritchard Traps
Phys. Rev. A **74**, 033622 (2006)
 - G. Reinaudi, T. Lahaye, A. Couvert, Z. Wang & D. Guéry-Odelin
Evaporation of an atomic beam on a material surface
Phys. Rev. A **73**, 035402 (2006)
- 2005**
- T. Lahaye, Z. Wang, G. Reinaudi, S.P. Rath, J. Dalibard & D. Guéry-Odelin
Evaporative cooling of a guided rubidium atomic beam
Phys. Rev. A **72**, 033411 (2005)
 - T. Aichele, V. Zwiller, M. Scholz, G. Reinaudi, J. Persson & O. Benson
Multiplexed quantum cryptography with single InP quantum dots
Proceedings of SPIE **5722**, 30-44 (2005)
 - A. Dantan, G. Reinaudi, A. Sinatra, F. Laloë, E. Giacobino & M. Pinard
Long lived quantum memory with nuclear atomic spins
Phys. Rev. Lett. **95**, 123002(2005)
- 2004**
- T. Aichele, G. Reinaudi & O. Benson
Separating cascaded photons from a single quantum dot : Demonstration of multiplexed quantum cryptography
Phys. Rev. B **70**, 235329 (2004)