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), coherent mater waves (atom laser)
- 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 optimization)
- Completed course by Andrew Ng (machine learning) and by G. Hinton (neural networks)
- Keen interests : Evolutionary Optimization, disruptive design for 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)

Professional Experience (continued)

2002

- **Experimental work on the Mega Ampere Generator for Plasma Implosion Experiments (MAGPIE)** 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

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

- Poster presentations at the annual conference *Division of Atomic, Molecular and Optical Physics*

2007

- Invited speaker at the conference *Quantum Engineering based on Atoms and Photons* in Hannover

20006-2008

- Presentations of results and achievements in internationally recognized groups in Canberra (Australia), Toronto (Canada), Berlin (Germany), Tokyo (Japan).

2006

- Poster presentation at the conference *European-Australian Workshop on Quantum Atom-Optics* in Canberra (Australia)

2005

- Poster presentation at the conference *Quantum Optics* in Les Houches (France)

Teaching :

2006-2008

- Scientific expert guide at the *Palais de la Découverte* (scientific museum) in Paris :
  Public demonstrations on physics, and designing of new experiments

2004-2005

- 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

- Fluent in French and English, knowledge of German

Hobbies

- 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)