



Steve Rolston

UMD Co-Director



# SCIENTIFIC RAISON D'ÊTRE

- *Coherent Quantum Phenomena*
  - Intersection of Condensed Matter, AMO, and Quantum Information
  - Understand QM in the context of information science
  - Exploit QM for new technologies



# 2006: JQI IS FORMED

MoU:

- The objectives of the JQI will be to:
  - Develop a world class research institute that will build the scientific foundation for **understanding coherent quantum phenomena** and thereby lay the foundation for engineering and controlling complex quantum systems capable of using the coherence and entanglement of quantum mechanics; and
  - Maintain and enhance the Nation's leading role in high technology through the creation of a powerful collaboration between and among NIST, UM, and NSA/CSS LPS; and
  - Establish a unique, interdisciplinary center for the interchange of ideas among atomic, condensed matter, and quantum information scientists.
  - To accomplish this objective, the JQI will train scientists and engineers for future industrial development and will provide U.S. industry with cutting edge research.

# STRUCTURE

- Cooperative Agreement between NIST and UMD
  - ~ 3.2 M\$/year evenly split
  - additional 2M\$/year for NIST programs
  - small contribution from NSA/LPS
  - renewed in 2012 for 5 years
  - administration at UMD (location of funds)



# CURRENT JQI FELLOWS

- Bob Anderson
- Sankar Das Sarma
- Victor Galitski
- Wendell Hill
- Bei-Lok Hu
- Bruce Kane (LPS)
- Chris Lobb
- Chris Monroe
- Luis Orozco
- Steve Rolston
- Jay Sau (Aug. 2013)
- Edo Waks
- Fred Wellstood
- Victor Yakovenko
- Garnett Bryant
- Gretchen Campbell
- Charles Clark
- Alexey Gorshkov (Aug. 2013)
- Paul Julienne
- Paul Lett
- Alan Migdall
- William Phillips
- Trey Porto
- Glenn Solomon
- Ian Spielman
- Jake Taylor
- Eite Tiesinga
- Carl Williams

# ATTRACTING QUALITY

- 2007: Chris Monroe, Victor Galitski
- 2008: Ian Spielman, Edo Waks
- 2009: Jake Taylor, Gretchen Campbell
- 2013: Jay Sau, Alexey Gorshkov

attempted: J. Folk (UBC), J. Petta (Princeton), A. Rey (JILA)



# ATTRACTING MONEY

- Physics Frontier Center (NSF)  
12.5M\$ (5 yr.) - 2009-2014
- JQI is *home* to three MURI awards
  - Quantum Simulation (2009)
    - PI – Chris Monroe; 5 yr. budget : 6.5M\$, 2.3M\$ at JQI
  - Ultracold Polar Molecules (2009)
    - PI – Paul Julienne; 5 yr. budget : 5.2M\$, 1.4M\$ at JQI
  - Atomtronics (2010)
    - PI – Ian Spielman; 5 yr. budget : 6.5M\$, \$4.8M at JQI

# RESEARCH PERSONNEL

- ~60 post-docs, ~50 grad students in the JQI
- Directly funded:
  - 17 graduate students
  - 25 post-docs
- Note: has greatly enhanced students at NIST
  - Gone from 2 to 15 Physics students pursuing PhD at NIST (within JQI labs)



# SCIENTIFIC OUTPUT

- Published papers
  - 120 papers (9/2011-9/2012)
- Talks at conferences
  - ~ 40-50 talks at DAMOP Meetings
  - ~ 40-50 talks at APS March Meeting

# JQI SEMINAR SERIES

- Started in 2006
  - Most highly attended seminar in Physics
    - (averages ~85-90 attendees - Limited by the room)
  - Inducement for NIST staff to come to campus

- Speakers include:

R. Hulet, J. Martinis, J. Petta, L. Levitov, I. Bloch, D. Steele, R. Laflamme, S. Girvin, Y. Nakamura, A. Kuzmich, I. Cirac, A. Imamoglu, K. Levin, J. Harris, S. Coppersmith, C. Regal, M. Lukin, B. DeMarco, R. Schoelkopf, Y. Yamamoto, J. Kimble, D. Wineland, J. Eberly, M. Devoret, L. Pitaevskii, M. Greiner, ...



# WORKSHOPS

- JQI Kick-off Workshop 2007
- Alkaline Earth Atoms Workshop 2009
- Post-Quantum Information Security 2010
- Foundations of QM 2012
  
- Intl. Conf. Atomic Phys. 2014
  - Expect ~900 attendees



# GRAD STUDENT APPLICANTS

- 722 total this year
- JQI-related interests:

2013      (2009)

- AMO - 231 (163)
- CME - 263 (199)
- CMT - 206 (129)
- JQI - 145 (69)
- QCE - 131 (96)
- QCT - 118 (78)

High energy exp. - 111  
Element. part. thy - 135  
Part. astro. - 116



# PHYSICAL SCIENCES COMPLEX

- New home for JQI Labs for UMD and NIST Fellows (everyone in the same place!)

Occupancy 2013



# ARRA GRANT

- Received \$10.3M in stimulus funds from NIST, with additional \$ 5.1M State matching funds
- “Laboratory for Advanced Quantum Science” - LAQS
- Only possible because of JQI (S. Rolston - sole PI)



# JQI AND PHYSICS DEPT.

- Added 14 adjunct faculty at no cost
- Greatly increased AMO ranking (top 5)
- Work to attract CM faculty
- Increased opportunities for graduate students
- Improved quality of graduate applicants
- Helped secure/expand PSC
- Work with dept. on infrastructure needs