

# Cooling Atoms with Lasers to Ultra-cold Temperatures



Ana Maria Rey  
Associate Research Professor, Physics Fellow, Astrophysics

## CURRENT RESEARCH


### Using light and electromagnetic fields to control atoms at the quantum level

The world of quantum mechanics is proving to be so difficult that without proper guidance from theorists, experimentalists would not have the necessary direction to make many of the discoveries that have occurred in recent years. Dr. Ana Maria Rey is performing computer calculations and developing analytical models of atoms cooled by lasers to .0000001 degree and lower of a Kelvin to understand the behavioral nature of those atoms as it translates to understanding the nature of quantum physics. The trapping of atoms in crystals of light, which are periodic traps formed by the interface of laser beams, provides insight into the behavior of electrons in solid state materials. This fundamental understanding of physics and quantum mechanics will enable researchers to develop a vast new range of advanced materials (such as improved high-temperature superconductors that conduct electricity without dissipation) with applications in transportation, defense, and high-performance electric motors, among other fields. Dr. Rey's work at the atomic scale is providing the basic building blocks for the development of a quantum computer, a machine that operates beyond the scope of a classical computer, and is improving atomic clocks, which have applications in GPS and satellites for communications and defense. Dr. Rey's research, while theoretical and laboratory based, is giving necessary direction to experimentalists and has the potential to revolutionize our understanding of real materials and to create new synthetic ones with no real analog in nature.

Dr. Ana Maria Rey, JILA Fellow and Associate Professor of Physics at the University of Colorado, is developing ways to engineer fully-controllable quantum systems based...

[Read More at benefunder.com/](https://www.benefunder.com/)

## AFFILIATION

 University of Colorado, Boulder

## EDUCATION

- Ph.D., in Physics, 2004 , University of Maryland, College Park
- B.S., in Physics, 1999 , Universidad de los Andes, Colombia

## AWARDS

- "Genius" Award 2003, MacArthur Foundation
- Maria Goeppert-Mayer Award 2014, American Physical Society
- Fundacion Alejandro Angel Escobar Exact, Physical and Natural Sciences Prize, September, 2007
- Postdoctoral Fellowship ITAMP, Harvard University
- Atomic, Molecular, and Optical Physics Outstanding Doctoral Thesis Award (DAMOP thesis prize) American Physical Society, 2005

## RESEARCH AREAS

Technology, Photonics / Imaging, Space

## FUNDING REQUEST

Due to the theoretical nature of Dr. Rey's research, your contributions will be used to secure qualified and competent laboratory personnel. Dr. Rey and her team work on theoretical physics in collaboration with experimentalists, providing necessary direction to help guide these experimentalists through the confusing quantum world. Funding will also be directed toward providing these researchers with the required infrastructure, in the form of computers and software.