Introduction to what we are doing in our cold atom lab in Kreger 115!

Let’s talk about the Nobel prizes in Laser Cooling and Optical Lattices (1997), Bose-Einstein Condensate (2001), and Quantum Entanglement (2005 and 2012)!

1997 and 2001: Laser Cooling and Bose-Einstein Condensate (BEC)

* Watch the 2 hour NOVA video “Absolute Zero – The Conquest of Cold and The Race for Absolute Zero”, located at <https://www.youtube.com/watch?v=5MqZOwIkeB4> (Episode 1 – 1 hr)

and <https://www.youtube.com/watch?v=kxKFeQF6_zc> (Episode 2 – 1 hr)

The 2001 Nobel Laureates will show you around their lab in Episode 2. This is what we do in our lab!!

* Read the [Nobel acceptance speech by Bill Phillips (Nobel 1997)](file://localhost/Volumes/web/users/balis/public.www/research/IntropackagesYounglings/ColdAtoms/BillPhillipsNobelRevModPhy1998.pdf) as he traces the history of laser cooling, especially the actual moment of discovery of cold atoms on page 728 followed by the amusing account of what happened the morning after.
* Watch the Nobel speech videos by the 2001 Nobelists for BEC:

1. Carl Wieman: “Bose-Einstein Condensation in a Dilute Gas; The First 70 Years and Some Recent Experiments” located at

<https://www.nobelprize.org/mediaplayer/index.php?id=480> (38 mins)

1. Wolfgang Ketterle: “When Atoms Behave as Waves: Bose-Einstein Condensation and the Atom Laser” located at

<https://www.nobelprize.org/mediaplayer/index.php?id=477> (40 mins)

3) Eric Cornell: located at <https://www.nobelprize.org/mediaplayer/index.php?id=473> (39 mins)

2005: Quantum optics with cold atoms: Atomic Clocks

* Watch the Nobel speech videos by the 2005 Nobelists:

1. Theodor Hansch “Passion for Precision” located at <https://www.nobelprize.org/mediaplayer/index.php?id=858> (44 mins)
2. John Hall “Defining and Measuring Optical Frequencies: The Optical Clock Opportunity and More” located at <https://www.nobelprize.org/mediaplayer/index.php?id=859> (44 mins)

2012: Quantum Entanglement (most experiments now use cold atoms)

* Watch the PBS video entitled “Quantum Leap” located at <http://www.pbs.org/wgbh/nova/physics/fabric-of-cosmos.html#fabric-quantum> to learn about the basics of Quantum Entanglement. (In fact, watch all 5 episodes of “The Fabric of the Cosmos” by Brian Greene for a truly entertaining time!)
* Watch the Nobel speech videos by the 2012 Nobelists:

1. David Wineland: “Superposition, Entanglement, and Raising Schroedinger's Cat” <https://www.nobelprize.org/mediaplayer/index.php?id=1873> (42 mins)
2. Serge Haroche: “Controlling Photons in a Box and Exploring the Quantum to Classical Boundary” <https://www.nobelprize.org/mediaplayer/index.php?id=1871> (42 mins)

By the way, all the physics Nobel speeches for every year since 2001, on topics ranging from cosmic expansion to graphene to spintronics to the big bang are located at <https://www.nobelprize.org/nobel_prizes/physics/video_lectures.html> .

ENJOY!