JESSE D. CROSSNO

EDUCATION

Harvard University: PhD Applied Physics, *Aug 2011 to May 2017*
Harvard University: SM Applied Physics, *Aug 2011 to May 2013*
Harvard Business School: "Mini-MBA" *Summer 2012*
UC-Santa Barbara: BS Physics, *Jun 2008 to Sep 2010*
Santa Barbara City College: *Sep 2006 to Jun 2008*

HONORS

Habicht Fellow, Harvard University
Harvard University Certificate of Distinction in Teaching
Outstanding Senior Award, U.C. Santa Barbara Physics Dept.
Physics Research Honors, U.C. Santa Barbara
Physics Highest Honors, U.C. Santa Barbara
U.C. Highest Honors, U.C. Santa Barbara
Top Physics Presentation, Sigma Xi Research Conference, 2007
U.C. Santa Barbara Dean's Honors List, Fall 2008-Winter 2009, Fall 2009-Spring 2010
Student of the Year, Santa Barbara City College, 2008
Santa Barbara City College Transfer Scholar, 2008
Gunther Family Scholar, 2008-2010

RESEARCH

Scientific Consultant Lineage Logistics, *May 2015 to present*

Lineage Logistics is the second largest cold storage logistic company in the United States with over 100 cold warehouse facilities. By analysing large data sets of thermally cycled warehouses, predictive algorithms can be formed using supervised machine learning as well as fundamental physical models. These algorithms are then used to optimize the energy efficiency and throughput of a facility by regulating power usage schedules, packing distributions, and equipment layout.

Visiting Scientist, Raytheon-BBN Technologies, *Jan 2014 to present*

Raytheon BBN's Quantum Information Processing group is an interdisciplinary team of physicists, mathematicians, information theorists, and systems engineers with expertise in superconducting quantum circuits, quantum memory physics, quantum and classical information theory, and classical optical networking. Within the group, I explore the use of Graphene's unique properties in the detection of single microwave and infrared photons for use in both free space quantum communication networks as well as on-chip readouts of our superconducting qubits.

Graduate Researcher, Harvard University, *Jan 2014 to Present*
Advisor: *Professor Philip Kim*

The thermodynamic behavior of 2-dimensional atomic crystals can be studied by measuring the spontaneous voltage fluctuations that occur across any electronic resistor at finite temperature (Johnson noise). By monitoring the microwave noise emitted by these devices, I study the thermo-electric behavior of several Van der Waals materials (Graphene, hBN, MoS_2, WSe_2, etc.) as well as the quasi-2D hetrostuctures that can be created layer-by-layer using these atomically flat crystals. These experiments are carried out in temperatures ranging from 10s of mK to room temperature.

Graduate Researcher, Harvard University, *Sep 2011 to Jan 2014*
Advisor: *Professor Lene Vestergaard Hau*

By applying a modest voltage to a single suspended carbon nanotube, extremely large electric fields can be generated in free space due to the nanotube's small radius. Neutral polarizable atoms are then attracted via an inverse square potential which exactly counters the radial dependence of the repulsive centrifugal barrier, resulting in the field ionization and capture of all incoming atoms with an angular momentum less than a critical value. A setup capable of condensing an ultracold cloud of Rubidium 87 atoms into a new state of matter known as a Bose-Einstein Condensate has been created to probe the capture dynamics of ultra dense atomic clouds with large thermal de Broglie wavelengths. Quantum mechanics predicts discrete allowable angular momentum states about the nanotune's axis which will readily result in discrete values of captured atom number.

Staff Scientist, University of California, Santa Barbara, *Sep 2010 to Dec 2010*
Advisor: *Professor Deborah Fygenson*

The survival rate of individuals infected with lethal respiratory pathogens can be improved by the introduction of therapeutic decoy liposomes. These decoys operate by presenting specific Glycan receptors known to be critical in the viral binding process of certain respiratory pathogens (specifically Influenza). This project was a joint effort between The Charles Stark Draper Laboratory, The University of Massachusetts, The Massachusetts Institute of Technology and The University of California-Santa Barbara. My specific role on the project was to design, characterize and manufacture the decoys, utilizing the Glycan receptors identified and synthesized by MIT, controlling for liposome size, charge, Glycan concentrations, and other useful parameters. I used various characterization techniques including: Fluorescence Microscopy, Dynamic-Light Scattering, Zeta Potential measurements, colorimetric determination of phospholipids and fluorometric determination of fluorescent lipid concentration.

Undergraduate Research Assistant, University of California-Santa Barbara, *Jun 2009 to Jun 2010*
Advisor: *Professor S. James Allen*

The behavior of Field-Effect Transistors (FETs) pushed beyond threshold is critical in the understanding of many devices that utilize similar designs that include potential barriers created by lateral gates. I studied the electron transport behavior across the barrier region as a function of source-drain voltage and barrier height.

Undergraduate Research Assistant, University of California-Santa Barbara, *Jun 2007 to Jun 2009*
Advisor: *Professor S. James Allen and Greg Dyer*

Resonant coupling of terahertz electro-magnetic waves and two-dimensional surface plasmons can be exploited to develop chip-based detectors able to perform spectroscopy. Lateral grating gates were implemented to externally tune the resonance frequency of a two-dimensional electron gas and an independently tunable lateral barrier gate (similar to that which is found within a common Field-Effect transistor) was added to dramatically improve the sensitivity of a device. I assisted in the design, setup, data collection and data analysis of various devices designed to absorb resonantly in the terahertz regime. Characterization of a device included the behavior of source-drain current as a function of various parameters including: source drain voltage, grating gate voltage, barrier gate voltage and external terahertz electro-magnetic radiation from the UCSB Free Electron Laser.

PUBLICATIONS

"Observation of the Dirac fluid and the breakdown of the Wiedemann-Franz law in graphene"
Jesse Crossno, Jing K Shi, Ke Wang, Xiaomeng Liu, Achim Harzheim, Andrew Lucas, Subir Sachdev, Philip Kim, Takashi Taniguchi, Kenji Watanabe, Thomas A Ohki, Kin Chung Fong
Science Vol. **351**, Issue 6277, pp. 1058-1061 (04 Mar 2016)

"Transport in inhomogeneous quantum critical fluids and in the Dirac fluid in graphene"
A Lucas, J Crossno, KC Fong, P Kim, S Sachdev
Phys. Rev. B **93**, 075426 (16 February 2016)

"Development of high frequency and wide bandwidth Johnson noise thermometry"
J Crossno, X Liu, TA Ohki, P Kim, KC Fong
Applied Physics Letters, **106** (2), 023121 (2015)

"A Plasmonic Terahertz Detector with a Monolithic Hot Electron Bolometer"
G Dyer, J Crossno, G Aizin, E Shaner, M Wanke, J Reno and S. J. Allen,
J. Phys.: Condens. Matter **21**, 195803 (2009).

"A narrowband plasmon terahertz detector with a monolithic hot electron bolometer"
G Dyer, J Crossno, G Aizin, J Mikalopas, E Shaner, M Wanke, J Reno and S. J. Allen,
SPIE OPTO: Integrated Optoelectronic Devices, 721503-721503-8 (2009)

TEACHING EXPERIENCE

Teaching Fellow, Harvard University, Spring 2013

Physics 129: Energy Science. Non-fossil-fuel based energy generation and storage represents a field of great current importance. The class covers those main areas of the field, where individuals with a physics, engineering physics, or physical chemistry background could make paradigm-changing contributions: solar (photo voltaic) cells, batteries/fuel cells, and photosynthesis.

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