New Faculty

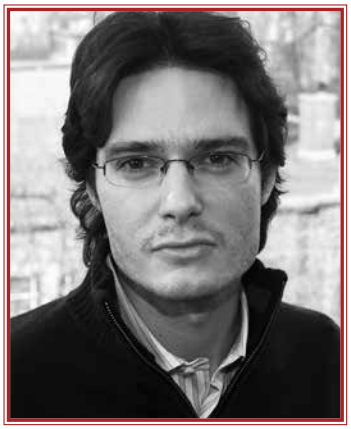
JULY 2016

Riccardo Comin

Assistant Professor of Physics, Division of Atomic, Biophysics, Condensed Matter and Plasma Physics

RESEARCH INTERESTS

Professor Comin's research explores the rich variety of electronic phases that can be crafted and engineered within the broad class of quantum materials. In these systems, the complex interplay between several intertwined degrees of freedom—charge, spin, orbital, and lattice—leads to novel states of matter where symmetries are broken by the emergence of electronic orders. These include, among others, antiferromagnetism; spin density waves; charge order; ferroelectricity; orbital order; and any combination thereof. The understanding and control of these phenomena, such as superconductivity, will pave the way for applications beyond conventional electronics. Examples would include quantum computing, efficient energy transport, and high-speed railroads.



The goal of the Comin group is to design and craft new quantum materials, using advanced light scattering techniques to investigate their special properties.

Light scattering and spectroscopy represent two core experimental toolsets to study and characterize symmetry-breaking phenomena in solids. In particular, the Comin group uses resonant X-ray scattering, which has the ability to look at ordered patterns arising from specific electronic states. Complementary to the facility-based X-ray work, the group will perform Raman scattering experiments as a function of several control parameters such as temperature, pressure and magnetic fields.

Systems of interest that exhibit emergent phenomena encompass the transition metal oxides (high-temperature superconductors, strong spin-orbit systems, multiferroics), rare earth-based compounds, and topological insulators. The Comin group will study single-crystalline materials, as well as thin films and heterointerfaces. In this context, they will also engage in the solution-based synthesis of inorganic and hybrid (mixed organic-inorganic) metal halides—a class of compounds that has recently garnered a lot of attention for optoelectronic applications and which they'll explore in the search for new exotic phenomena.

BIOGRAPHICAL SKETCH

Riccardo Comin joined MIT as an assistant professor of physics in July 2016. He completed his undergraduate studies at the Universita' degli Studi di Trieste in

Italy, where he also earned a MSc in Physics in 2009. Later, he pursued doctoral studies at the University of British Columbia, Canada, earning a PhD in 2013. Prior to MIT, Comin was an NSERC postdoctoral fellow at the University of Toronto.

For his work using synchrotron-based X-ray scattering methods on quantum materials and electrically-tuned optoelectronic materials, Comin received the Bancroft Thesis Award (2014), Fonda-Fasella Award (2014), John Charles Polanyi Prize in Physics (2015), McMillan Award (2015), and Coles prize (2016).

For a list of Prof. Comin's selected publications, please visit his faculty web page at web.mit.edu/physics/people/faculty/comin_riccardo.html.

Kerstin Perez

Assistant Professor of Physics, Division of Experimental Nuclear & Particle Physics; MIT Laboratory for Nuclear Science

RESEARCH INTERESTS

Professor Perez is interested in using cosmic particles to look for physics beyond the Standard Model, particularly for evidence of dark matter interactions. She leads the silicon detector program for the General Anti-Particle Spectrometer (GAPS) experiment, a balloon-borne instrument that aims to detect antideuteron and antiproton evidence of dark matter annihilation in the Galactic halo. As the first optimized experiment to search for low-energy antideuterons—which have been discussed for over a decade as a particularly low-background signature of dark matter—GAPS is poised to make a major contribution to the field. In addition, Perez is head of the analysis of high-energy X-ray emission in the inner parsecs of the Galaxy using the NuSTAR telescope array, and is involved in searches for X-ray signatures of exotic particle physics processes. Perez has also begun work on the prototype X-ray optics for the International Axion Observatory (IAXO), the upgrade to the CAST solar axion helioscope experiment.

In addition to mentoring students in research, Perez has a passion for science education and outreach, placing particular emphasis on connecting with students who, because of cultural factors or lack of exposure, have not considered the career paths that a science education opens.

BIOGRAPHICAL SKETCH

Kerstin Perez joined the MIT physics department as an assistant professor in July 2016. She is originally from West Philadelphia, and earned her BA in physics from Columbia University in 2005. Perez earned a PhD from the California Institute of Technology in 2011, where her research focused on commissioning the ATLAS pixel detector in preparation for the very first LHC collisions, and on understanding hadronic jet physics with initial data. Perez then returned to Columbia University as an NSF Astronomy and Astrophysics Postdoctoral Fellow, developing the GAPS Si(Li) detectors and NuSTAR Galactic Center analyses. Prior to MIT, she was an assistant professor of physics at Haverford College.

For a list of Prof. Perez's selected publications, please visit her faculty web page at web.mit.edu/physics/people/faculty/perez_kerstin.html.