Contribution ID: **1050** Type: **Invited Speaker / Conférencier invité**

The Promise of Quantum Nonlinear Optics

Tuesday, 14 June 2016 17:00 (30 minutes)

This presentation first reviews the historical development of the field of nonlinear optics, starting from its inception in 1961. It then reviews some of its more recent developments, including especially how nonlinear optics has become a crucial tool for the developing field of quantum technologies. Fundamental quantum processes enabled by nonlinear optics, such as the creation of squeezed and entangled light states, are reviewed. We then illustrate these concepts by means of specific applications, such as the development of secure communication systems based on the quantum states of light in the form of states that carry orbital angular momentum. Light can carry angular momentum both by means of its spin angular momentum (as manifested for example in circular polarization) and by means of its orbital angular momentum (OAM), whose origin is a helical structure of its wavefront. The orbital angular momentum of light has recently been recognized to constitute a crucial attribute for many photonic technologies, including the trapping and manipulation of small particles and for multiplexing in optical telecommunication. In this presentation we review some of the fundamental properties of OAM including its quantum features such as entanglement. We then go on to describe a secure telecommunication system in which information is encoded in OAM, and which can carry more than one bit of information per photon.

Primary author: BOYD, Robert (University of Ottawa)

Presenter: BOYD, Robert (University of Ottawa)

Session Classification: T3-3 Quantum Computing and Coherent Control (DAMOPC) / Calcul quantique et contrôle cohérent (DPAMPC)

Track Classification: Division of Atomic, Molecular and Optical Physics, Canada / Division de la physique atomique, moléculaire et photonique, Canada (DAMOPC-DPAMPC)