

# **Magnetoelectric effect in tunneling junctions: a route to room temperature multiferroic devices**

Thomas Archer, Nuala Caffrey and Stefano Sanvito  
School of Physics, Trinity College Dublin  
Email: archert@tcd.ie

## **Abstract**

Multiferroics may hold the key to solving many of the problems of single ferroics for future devices. Currently no single phase multiferroic exists that demonstrates multiferroicity at room temperature. Magnetic tunnel junctions (MTJs) incorporating functional materials as insulating barriers have the potential of becoming the founding technology for novel multifunctional devices. Ferroelectric materials are also starting to play an important role as non-volatile ferroelectric RAM. Combining ferroic attributes in a single device may allow devices to be created that bypass the problems of each single ferroic attribute, allowing the creation of a range of new multiferroic devices.

In this work we intend to calculate from first principles the surface structure and the transport characteristics of a tunneling junction where the spacer material is replaced with a ferroelectric material. The ferroelectric polarization will be allowed to point in opposite directions and its modulation of the tunneling current will be quantified.