Svetlana V. Boriskina and **Björn M. Reinhard at Boston University** discuss in *Nanoscale* an alternative approach for **plasmonic nanocircuit engineering** that is based on molding the optical powerflow through 'vortex nanogears' around a landscape of local phase singularities 'pinned' to plasmonic nanostructures. They show that coupling of several vortex nanogears into transmission-like structures results in dramatic optical effects, which can be explained by invoking a hydrodynamic analogy of the 'photon fluid'. The new concept of vortex nanogear transmissions (VNTs) provides new design principles for the development of complex multi-functional phase-operated photonics machinery and, therefore, generates unique opportunities for light generation, harvesting and processing on the nanoscale.

Svetlana V. Boriskina and Björn M. Reinhard: Molding the flow of light on the nanoscale: from vortex nanogears to phase-operated plasmonic machinery, In: *Nanoscale, Advance Article*, November 30, 2011, DOI:10.1039/C1NR11406A:
http://dx.doi.org/10.1039/C1NR11406A

http://bio-page.org/boriskina/

http://www.bu.edu/reinhardlab/

A team of scientists, led by **Guillaume Gervais** from **McGill's Physics Department** and **Mike Lilly from Sandia National Laboratories**, has engineered one of the **world's smallest electronic circuits**. It is formed by two wires separated by only about 150 atoms or 15nm. This is the first time that anyone has studied how the wires in an electronic circuit interact with one another when packed so tightly together. Surprisingly, the authors found that the effect of one wire on the other can be either positive or negative. This means that a current in one wire can produce a current in the other one that is either in the same or the opposite direction. This discovery, based on the principles of quantum physics, suggests a need to revise our understanding of how even the simplest electronic circuits behave at the nanoscale.

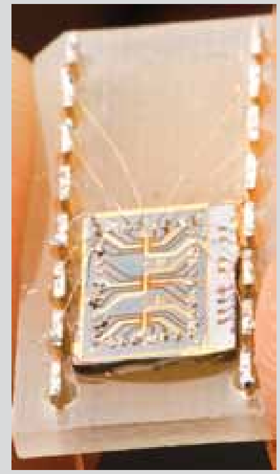

Image: The suitcase-like handle are the two nanowires, one above the other. The darkest areas are gallium arsenide crystal. The two lighter areas in the shape of "plus" signs are gold gates at the top and bottom of the device.

D. Laroche, G. Gervais, M. P. Lilly, J. L. Reno: Positive and negative Coulomb drag in vertically integrated one-dimensional quantum wires, In: *Nature Nanotechnology*, Vol. 6(2011), No.12, December 2011, Pages 793-797, DOI:10.1038/nnano.2011.182:
http://dx.doi.org/10.1038/nnano.2011.182

http://www.mcgill.ca