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Extremely Efficient Multiple Electron-hole Pair Generation in Carbon Nanotube Photodiodes

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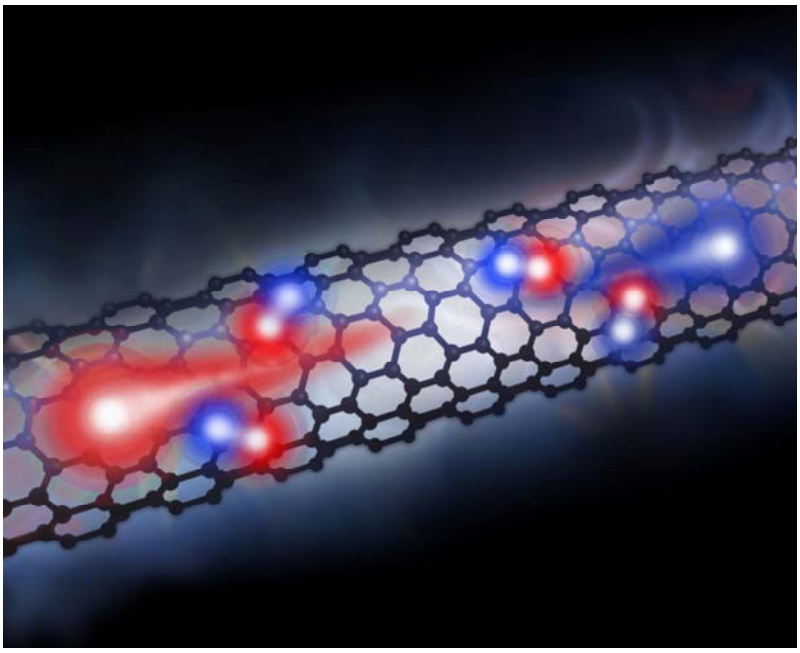

The electronic properties of charge carriers in graphene sheets and carbon nanotubes exhibit striking similarities to relativistic elementary particles. Interestingly, the small Fermi velocity in single walled carbon nanotubes (SWNTs) leads to an effective fine structure constant $\alpha = e^2 / 4\pi\varepsilon\hbar v_F \sim 1$, suggesting that high-energy carriers should efficiently generate particle-antiparticle (electron-hole) pairs. Here, I will discuss recent observations of highly efficient generation of electron-hole pairs due to impact excitation in SWNT p-n junction photodiodes. This process, analogous to relativistic particle-antiparticle creation, could theoretically improve the efficiency of photovoltaic solar cells beyond standard thermodynamic limits.

Date: Friday Nov. 6th, 2009
Time: Lunch at 12 noon
Talk begins at 12:15 PM
Place: Phillips 231 Lounge

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Also partially funded by GPSA. Meeting is open to all Cornell students, faculty, and staff.