Thursday, Sept. 6th
Scaife Hall Auditorium
Room 125 at 4:30 p.m.
Refreshments at 4:00 p.m.

Prof. Matt Reynolds
Department of Electrical and Computer Engineering
Duke University

Matt Reynolds is the Nortel Networks Assistant Professor of Electrical and Computer Engineering at Duke University. He received S.B., M.Eng., and Ph.D. degrees from MIT, and was a Motorola Fellow at the MIT Media Lab from 1997-2002. Matt co-founded the RFID systems firm ThingMagic Inc. in 2000 and served as Chief Technology Officer from 2002-2007. He joined the Duke faculty in January 2008. Matt is also co-founder of the energy conservation firm Zensi, acquired by Belkin Inc. in 2010. He is a Senior Member of the IEEE, has received four Best Paper awards, and has 10 issued and over 20 pending patents.

Ultra-light Wireless: Radically rethinking radios to peer into the minds of insects in flight

Over time, the energy cost of computation has steadily fallen due to progressive advances predicted by Moore’s Law, while the energy cost of communication remains fundamentally limited by the signal power required to overcome noise and interference at the receiver. Across a diverse space of power-limited wireless devices, including sensor networks and mobile devices, it is often assumed that the energy cost of communication is dominant. This assumption has driven both algorithm design as well as platform design across a wide variety of systems.

This talk will challenge this assumption by showing how a radical rethinking of the wireless link can push the burdens of energy cost and complexity from edge nodes to access points. Motivated by the desire to understand flight control in insects, we have developed tiny wireless backpacks for dragonflies that acquire and transmit neural and EMG data from flying insects at rate of 5 Mbps. Remarkably, by communicating with modulated scattering rather than traditional radios, we have achieved a communication energy cost of only 4.9 pJ/bit, over 100X lower than traditional approaches. Using wireless power transfer to eliminate the battery, the backpack weighs only 38 mg, less than half the weight of a postage stamp.

Dipole Antenna
Telemetry Backpack