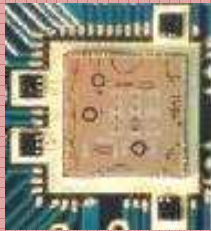


# Integration of Wireless Sensor Nodes

Elizabeth Reilly

# Wireless Sensor Node

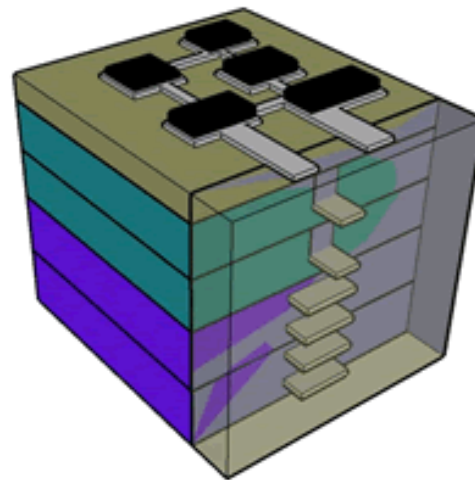
Low Power Radio



Power Storage



Sensor



"Picocube"

Renewable Power



Supply

# Introduction

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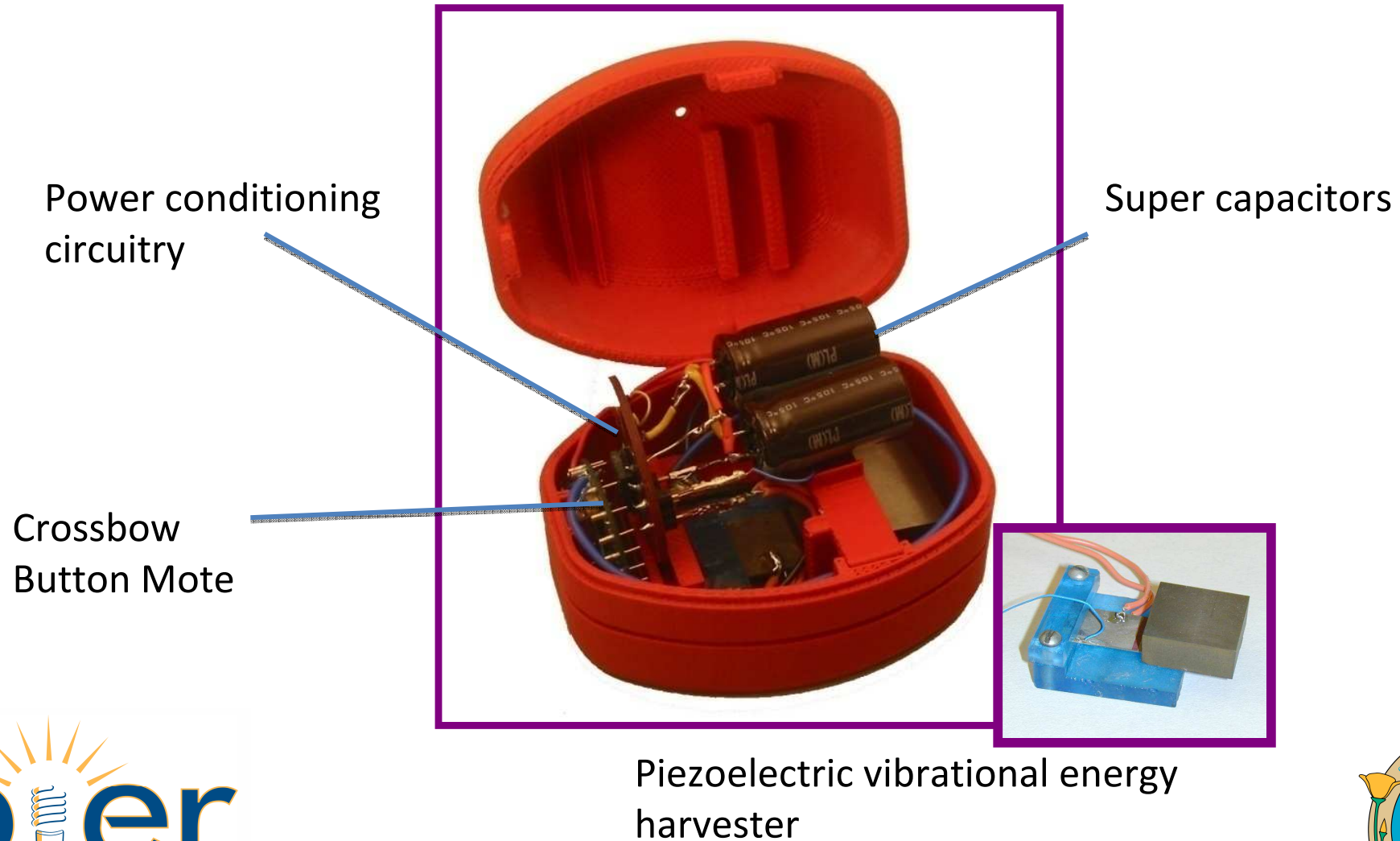
- Fabrication of radio, energy scavenging system, energy storage, and sensor first generation near completion
- Next steps:
  - Integration of individual technologies to form functioning node
  - Testing of node bench-top environment
  - Testing of node in household environment

# Take Aways

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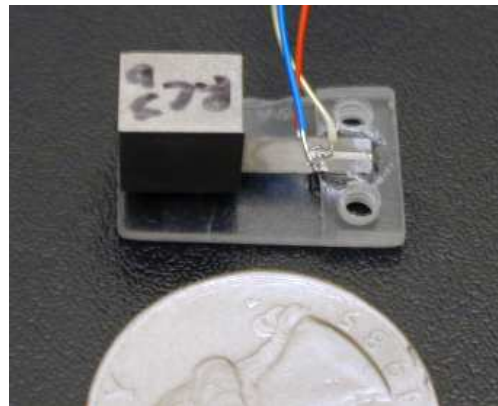
- **Radio:** Combination of advanced devices and new radio architectures delivers wireless communication with very low power and cost
- **Power Scavenging:** MEMS energy harvesting is an enabling technology for wireless sensor nodes, providing replenishable power, reducing required maintenance, and achieving size reductions.
- **Power Storage:** Direct write printing gives us the flexibility to deposit our energy storage in open spaces and tailor its dimensions to best utilize the little footprint area we are allocated for the optimal amount of energy storage
- **Sensor:** Passive, proximity-based MEMS current and voltage sensors will enable end-use electricity monitoring in homes and buildings, as well as monitoring of electric power in other applications.
- **Integration:** Integration of the components of the wireless sensor node has begun with a working mesoscale prototype expected by December.

# Macro Integration

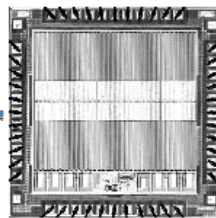


# Meso Integration

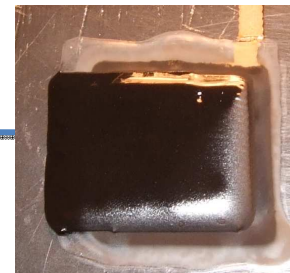
Initial integration attempt using prototypes available in 2008 and printed capacitor



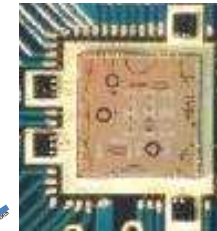
Macro Scale Energy  
Piezoelectric Scavenging  
System



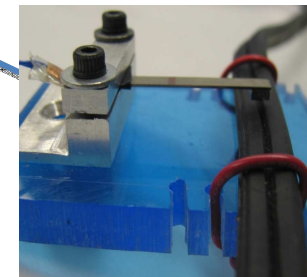
Power  
conditioning  
circuitry (*M.  
Seemans*)



Dispenser  
printed capacitor  
(*C. Ho*)



Low power radio  
(*M. Mark et al*)

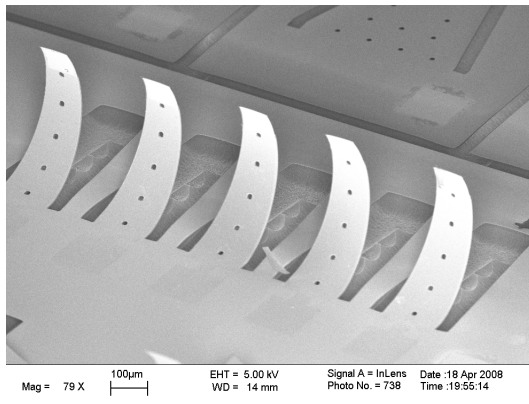


Current sensor (*E.  
Leland*)

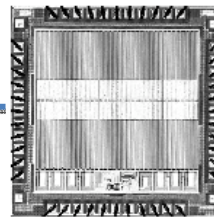


# Micro Integration

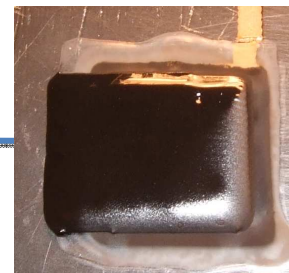
Second integration attempt using microfabricated prototypes available in Spring 2009



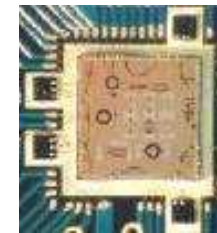
Microfabricated piezoelectric energy scavenging system  
(*L. Miller et al*)



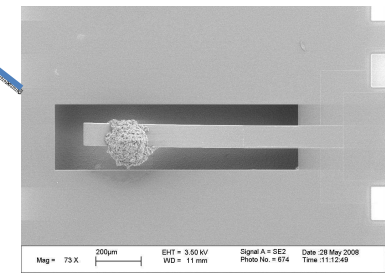
Power conditioning circuitry (*M. Seemans*)



Dispenser printed capacitor (*C.Ho*)



Low power radio  
(*M. Mark*)



Microfabricated current sensor  
(*E. Leland*)

# Conclusions

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- Current radio, power circuitry, and energy storage devices all functional
- Working 1<sup>st</sup> generation of microscale energy scavenging system and sensor by January
- Integration of power circuitry with OTS sensor, power storage, and mesoscale piezoelectric scavenger currently underway
- Working proof of concept mesoscale prototype by January
- Microscale integration starting in December
- Testing of devices is on going