



# Institute for Materials Science

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## IMS Rapid Response Recipient 2016 Phase II Lecture



**John Bernardin**

**AET-1: Applied Engineering Technology - 1  
Los Alamos National Laboratory**

### **Rapid Response 2016 Phase I talk**

**Tuesday, May 3, 2016**

**2:00 pm to 3:00pm**

**MSL Auditorium (TA-03 - Bldg 1698 - Room A103)**

**Abstract:** In the additive manufacturing (AM) of plastic components using a fused deposition method machine, plastic filament is carefully heated and extruded through a nozzle and deposited on a horizontal build plate. This process is also known as 3D printing, where the quality of this manufacturing process is limited in part by the lack of build process monitoring and control. Monitoring the structural quality of parts printed using AM is crucial to the transition of 3D printing from hobbyists to research and development arenas as well as large scale manufacturing sectors. Even more beneficial would be the implementation of a feedback system with the AM process to detect in situ defects. By directly integrating sensing materials into AM filaments and coupling the readout of the sensing element with an advanced signal processing technique, e.g., compressive sensing (CS) [1], the entire structure can be monitored for damage (during or after printing). The conductivity of graphene, an allotrope of carbon, is sensitive and tunable to environmental variations and structural damage/stress, making it a perfect sensing material for various applications. However, during the printing process, graphene tends to aggregate within the printable polymeric base, leading to decreased and inconsistent conductivity.

**Bio:**

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*Hosted by Alexander Balatsky \* Director of the Institute for Materials Science*