Tuesday 26th Mar

GHC 2109  1:30pm – 2:30pm
Pizza will be served

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The Tribology of Particles and Particle Flows:
Studying their Behavior wherever they *Surface*

Abstract: Particles and particulate flows often emerge as barriers or enablers to the advancement of a wide array of engineering technologies. In biotechnology, they can cause diseases such as osteolysis in artificial hip and knee joints. In extreme environments such as space, particles can bring both good news and bad news. For example, the good news is that powder particles can be employed as solid lubricants in sliding contact applications where oils cannot be used; the bad news is that environmental particles can wreak havoc on planetary space technologies in sliding contacts, thereby causing critical surfaces to become eroded or contaminated. Other extreme-environment applications, such as drilling for energy fuels, require a sophisticated understanding of particles since rock debris must be removed and drilling fluids often include complex particulate media.

The *initial* part of the talk will introduce the overall core competencies of the Particle Flow & Tribology Laboratory (PFTL). Particle research projects involving fossil fuel drilling, lunar dust erosion, and self-replenishing solid/powder lubrication applications will be highlighted to show the breadth of the lab’s work. The *second* segment of this presentation will go into a depth sequence on our research on granular flows. Often found in sliding contacts, the flow of granular materials is of great scientific interest because these materials are prevalent in many scientific arenas. For example, granular flows are of interest to the field of space exploration, where many destinations, such as planets, moons, and asteroids, are covered in a fine layer of loosely-consolidated granular material called “regolith”. Understanding the flow of granular materials requires detailed fundamental studies which leverage both experiments and modeling. While problems with flowing granules typically appear straightforward, they can quickly begin to show highly nonlinear behavior and require numerically-intensive computer models which are difficult to validate experimentally. This segment will walk through some of the interesting steps the PFTL is taking to advance the science and engineering of granular flows.

Speaker Bio: C. Fred Higgs, III is a Professor in the mechanical engineering department at Carnegie Mellon University. A researcher in numerous Carnegie Mellon research centers and an affiliated faculty member in the electrical & computer engineering (ECE) department, Professor Higgs is an Associate Editor for both the ASME *Journal of Tribology* and the STLE *Tribology Transactions* journal. From the Fall of 2003 to the present, he has been the research advisor to 70 undergraduate, 17 Masters, and 10 doctoral students. Two of his three graduated PhD students are now tenure-track assistant professors in mechanical engineering. He was the recipient of a NSF “CAREER” award in 2007 and is the director of the Carnegie Mellon Sloan Minority PhD program. In 2010, he was named the Clarence H. Adamson Career Faculty Fellow, and was also the recipient of the 2010 ASME Burt L. Newkirk award, “given to an individual under 40 who made a notable contribution to the field of tribology through research and/or development.” Later this month, he will receive the 2012 Benjamin Richard Teare Teaching Award from the Carnegie Mellon College of Engineering. He is married with two young children ages 1 and 3.

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