



The Department of
Mechanical Engineering
PRESENTS

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Bulk Metallic Glass Gears for NASA JPL Robotics Applications

Abstract:

The development of gears for high-performance robotics, both terrestrial and planetary, has long been driven by design, the performance of lubricated steel gears, and the precise manufacturing of the gear components. Complex gear designs required in many robotics applications make up the majority cost of the robot, owing to the intricate manufacturing of steel. For space applications, the problem is compounded by extremely low temperatures, which preclude most lubricants. NASA JPL has been developing a unique class of BMG gearboxes for robotics using cutting edge technology for both the alloys and the manufacturing. This talk focuses on the need for low-cost, high-performance gearboxes and will give a status report of the research, including prototyping, alloy development, and testing. We show that BMGs not only have the potential for use as unlubricated gearboxes for space applications, but also as a revolutionary material for decreasing the manufacturing cost of all humanoid robotics. The talk will also detail the ongoing metallurgy work at NASA JPL, including a large effort in metal additive manufacturing.

About the Speaker:

Dr. Douglas Hofmann is a Technologist and founding member of the Materials Development and Manufacturing Technology Group at JPL. He is also a Visiting Associate and Lecturer in Materials Science and Applied Physics at Caltech. He has a B.S. and M.S. in Mechanical Engineering from U.C. San Diego and an M.S. and Ph.D. in Materials Science from Caltech. Prior to joining JPL, he was a Research and Development Scientist at Liquidmetal Technologies. Dr. Hofmann has received many awards for his research, most notably the 2012 Presidential Early Career Award for Scientists and Engineers from President Obama for his work in the development of metallic glass metal matrix composites.