



Spring 2026 Distinguished IE Seminar

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Five Decades of Orthopaedic Biomaterials Research: Lesson Learned

Thursday, April 30, 2026 | 1:30pm | Krannert – Room 140

ABSTRACT

The last five decades have witnessed dramatic advances in the performance and application of engineering materials in the treatment of musculoskeletal disease and injury. This is particularly true for total joint arthroplasty, procedures popularized in the United States in the late 1960s (hip replacement) and 1970s (knee replacement). The design, manufacturing processes and materials deployed in contemporary joint replacement components have converged, reflecting effective solutions to implant fracture, implant loosening, modular junction tribocorrosion, and bearing surface wear that plagued earlier generations of joint replacement devices. However, challenges remain that limit survivorship and functionality of joint replacements. This presentation will address the current state-of-the-art through the lens of an orthopaedic surgeon with an undergraduate degree in materials science and engineering. Based on the findings in the analysis of failure mechanisms of metal-on-metal bearings in total hip replacements, the challenges and opportunities in contemporary orthopaedic biomaterials research and development will be delineated.

BIO

Joshua J. Jacobs, M.D. received a Bachelor of Science in Materials Science and Engineering from Northwestern University. As an undergraduate, he participated in a cooperative engineering education program in which he served as a research assistant in the Department of Biological Materials at the Northwestern University Dental School. Dr. Jacobs graduated from the University of Illinois Medical School and completed his residency at the Combined Harvard Orthopaedic Residency Program during which time he was a Research Fellow at the H. H. Uhlig Corrosion Laboratory of the Massachusetts Institute of Technology under the tutelage of Ronald Latanision, PhD. He completed his medical training with a Fellowship in Adult Reconstructive Orthopaedic Surgery at Rush University Medical Center in Chicago, Illinois. Dr. Jacobs has remained at Rush since his fellowship training and served as the William A. Hark, M.D./Susanne G. Swift Professor and Chair of the Department of Orthopaedic Surgery for 16 years. He also served as the Vice Provost for Research at Rush University and is currently the Grainger Director of the Rush Arthritis and Orthopaedics Institute.

Dr. Jacobs has published over 300 peer-reviewed manuscripts, most of which focus on the biological consequences of material degradation from joint replacement implants. Dr. Jacobs has received several research grants from the National Institutes of Health as well as several awards for his biomaterials research including the Kappa Delta Award from the American Academy of Orthopaedic Surgeons (AAOS). Dr. Jacobs is a Past President of the AAOS and the Orthopaedic Research Society. He currently serves as the President of the Board of Trustees of the Orthopaedic Research and Education Foundation.