

**Nathan B. Crane**  
**Assistant Professor, Mechanical Engineering**

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**EDUCATION**

**Massachusetts Institute of Technology** Cambridge, Massachusetts, 2001-2005  
*Ph.D. in Mechanical Engineering* 2005  
*Major: Design and Manufacturing* *Minor: Material Science*  
Thesis Title: "Nanometer metal dispersions as a binder for three-dimensional printing metallic components"  
GPA: 5.0/5.0

**Brigham Young University** Provo, Utah, 1992-1993, 1995-1999  
*M.S. in Mechanical Engineering* 1999  
Thesis Title: "Compliant Centrifugal Clutches: Design, Analysis, and Testing"  
GPA: 4.0/4.0  
*B.S. in Mechanical Engineering magna cum laude* 1998  
GPA: 3.94/4.0

**EXPERIENCE**

**Assistant Professor:** University of South Florida, Department of Mechanical Engineering 2006-Present

- Research Interests:
  - Assembly, particularly of micro and nanoscale components
  - Solid freeform fabrication (rapid prototyping) process and material development
  - Design theory and methodology
  - Thermal Protection Systems (TPS) for hypersonic flight
- Courses: EML 4501 Machine Design

**Postdoctoral Appointee:** Organic Materials Department, Sandia National Laboratories 2005-2006  
Supervisor: Dr. John Emerson

- Developed processing and testing methods for oxidation protection of carbon-carbon composites at high temperatures (>1600 C)
- Advised design teams on adhesive bonding of dissimilar materials subject to temperature variation

**Doctoral Research:** Mechanical Engineering Department, MIT 2001-2005  
Advisor: Prof. Emanuel Sachs

- Created metallic binder from nanometer colloid for improved dimensional accuracy of three-dimensional printed (3DP) parts
- Developed methods for creating dense metal layers from nano-metal colloids
- Designed a self-powered device for distraction osteogenesis of the mandible

**Civil and Mechanical Engineering Instructor:** MIT SEED Academy 2003-2004  
Supervisor: Ms. Nicole Stark

- Taught basic engineering and physics concepts to high school students from struggling local schools
- Developed lecture, laboratory, and project-based learning experiences for the students

- Engineer:** Pratt & Whitney 1999-2001
- Designed new generation swept fan blades for commercial aircraft engines
  - Integrated traditionally separate roles of mechanical design and structural analysis
  - Analyzed blades for vibration modes, low cycle fatigue, and high cycle fatigue failures
  - Invented new method for reducing damage due to “blade-off” events
  - Supervised drawing production personnel and intern
- Masters Research:** Mechanical Engineering Department, BYU 1998-1999  
Advisor: Prof. Larry Howell
- Invented novel compliant centrifugal clutch designs with increased torque output
  - Modeled centrifugal clutch torque output and engagement speeds
- Associate Engineer:** Caldera 1997-1999
- Modeled severe service valves in CAD
  - Produced production drawings
  - Analyzed transient thermal stresses
- Undergraduate Intern:** DX-10, Los Alamos National Laboratory 1996  
Advisors: Dr. Steve Son, Mr. Cary Skidmore
- Designed and tested apparatus for dynamic compression testing of high explosives
  - Collected data on time-dependent room temperature deformations
  - Analyzed micrographs to quantify microstructure changes during processing of high explosives

## PUBLICATIONS

### *Journals*

**Crane, N. B.**, Wilkes, J., Sachs, E., Allen S. M., “Improving Accuracy of Powder-based SFF Processes by Metal Deposition from a Nanoparticle Dispersion”, *Rapid Prototyping Journal*, Vol 12, No 5, 2006, p 266-274.

**Crane, N. B.**, Howell, L. L., Weight, B. L., Magleby, S. “Design and Testing of a Compliant Floating-Opposing-Arm (FOA) Centrifugal Clutch,” *ASME Transactions Journal of Mechanical Design*, Vol 126, No. 1, Jan. 2004, p 169-177.

Skidmore, Cary B., Phillips, David S., **Crane, Nathan B.**, “Microscopical Examination of Plastic-Bonded Explosives,” *The Microscope Journal*, Vol 45, No 4, 1997, p 127-136.

### *Peer-Reviewed Conferences*

**Crane, N. B.**, Nellis, M., Nolas, G., and Harmon J., “Solid Freeform Fabrication by Directed Self Assembly”, 2007 Solid Freeform Fabrication Symposium, August 6-8, 2007, Austin, TX.

**Crane, N. B.**, Wilkes, J., Sachs, E., Allen S. M., “Improving Accuracy of Powder Sintering-based SFF Processes by Metal Deposition from Nanoparticle Dispersion”, 2005 Solid Freeform Fabrication Symposium, Austin, TX.

**Crane, N. B.**, Gray, J. M., Mendelowitz, S. E., Wheeler, J. W., Slocum, A. H., “Design and Feasibility Testing of a Novel Device for Automatic Distraction Osteogenesis of the Mandible,” 2004 ASME Design Engineering Technical Conferences, DETC 2004-57232.

**Crane, N. B.**, Howell, L. L., Weight, B. L., “Investigation of Compliant Centrifugal Clutch Designs,” Proceedings of the 2001 ASME Design Engineering Technical Conferences, DETC01.

### ***Other Conference Presentations***

Ramadoss, V, and **Crane, N. B.**, “Design of fluidic self-assembly bonds for precise component positioning”, SPIE Photonics West, 22-24 January, 2008, San Jose, CA.

**Crane, N. B.**, Volinsky, A. A., Ramadoss, V., Nellis, M., Mishra, P., and Pang, X., “Analysis and Measurement of Forces in an Electrowetting-Driven Oscillator”, *Microelectromechanical Systems-Materials and Devices*, Mater. Res. Soc. Symp. Proc. Vol 1052, Warrendale, PA, 2007, DD 8.1.

**Crane, N. B.**, Galloway, J. A., and Emerson, J. A., “Siloxane-derived Treatments for Oxidation Protection of Carbon-Carbon Composites”, 2006 National Space and Missile Materials Symposium (NSMMS) 26-30 June, 2006, Orlando, FL.

Galloway, J. A., **Crane, N. B.**, Emerson, J.A., and Lee, S., “Oxidation Resistant Thermal Protection Materials for Hypersonic Vehicles”, SAMPE 2006 Long Beach, April 30-May 4, 2006.

**Crane, N. B.**, Wilkes, J., Sachs, E., and Allen S., “Nanoparticle Densification by Pressureless Sintering”, SAMPE 2006 Long Beach, April 30-May 4, 2006.

**Crane, N. B.**, Sachs, E., and Allen, S. M., “Densification of Monodisperse Iron Nanoparticles from a Colloidal Dispersion at Moderate Heating Rates and Temperatures”, Symposium on Amorphous and Nanocrystalline Metals for Structural Applications, 2005 MRS Fall Meeting, published in MRS Proceedings Vol 903E.

Galloway, J., **Crane, N. B.**, Emerson, J. A., “Oxidation Resistant Thermal Protection materials for Hypersonic Vehicles”, Seventeenth Annual Rio Grande Symposium on Advanced Materials, October, 2005, Albuquerque, NM.

**Crane, N. B.**, Sachs, E., and Frank, A., “Strengthening Porous Skeletons by Metal Deposition from a NanoParticle Suspension”, LL3.3, presented at MRS Symposium on Materials issues in Solid Freeform Fabrication, 2004 MRS Fall Meeting, November 29-December 3, 2004.

Peterson, Paul D., Idar, Deanne J., **Crane, Nathan B.**, Rabie, Ron, and Fugard, Christopher S., “Quasi-static Multi-axial Testing of PBX 9501: Creep Effects on Estane Molecular Weight,” 21st Aging, Compatibility, and Stockpile Stewardship Conference, Sandia National Laboratory, Albuquerque, NM, September 30-October 2, 1997.

### ***Technical Reports***

Smith, J. et. al., *Arc Jet Results for Coated and Self-Coating TPS Materials*, Sandia National Laboratories Technical Report, SAND2006-5075, Albuquerque, NM 2006.

Peterson, Paul D., Idar, Deanne J., **Crane, Nathan B.**, Rabie, Ron, and Fugard, Christopher S., “Quasi-static Multi-axial Testing of PBX 9501: Creep Effects on Estane Molecular Weight,” Los Alamos National Laboratories Technical Report, LA-UR-99-684.

**Patents**

**Crane, N. B.**, “Fan Blade Platform Feature for Improved Blade-Off Performance,” U.S. Patent No. 6,991,428 B2, issued January 31, 2006.

Howell, L.L., and **Crane, N.B.**, “Compliant Clutch”, U.S. Patent No. 6,736,249, issued May 18, 2004.

**HONORS AND AWARDS**

- Best Paper Award, 2005 Solid Freeform Fabrication Conference
- MIT Presidential Fellowship, 2001
- First Place, Graduate Division, 2000 ASME Student Mechanism Competition
- National Science Foundation Graduate Fellowship, 1998-2001

**SERVICE & AFFILIATIONS**

- Member of Department Subcommittee on Undergraduate Curriculum
- NSF Reviewer and Panelist for CMMI division in Engineering Directorate
- Review and Panelist Internal USF Proposals (Fall 2006 – Fall 2007)
- Member Graduate Student Council subcommittee on Academic Advising and Research Ethics, 2004
- Substitute instructor, MIT SEED Academy, 2004
- BYU Mechanical Engineering Student Advisory Board (MESAB), 1998
- Missionary for the Church of Jesus Christ of Latter-day Saints, 1993-1995
- American Society of Mechanical Engineers (ASME)
- Materials Research Society (MRS)
- American Society for Engineering Education (ASEE)