

## ANDREW GOULDSTONE

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### EDUCATION AND EXPERIENCE

- 2008- Assistant Professor, Dept. of Mech. & Ind. Engineering, Northeastern University  
2003-2007 Assistant Professor, Dept. of Materials Science and Engineering, SUNY Stony Brook  
2001-2003 Postdoctoral Fellow, Physiology Program, Harvard School of Public Health  
1996-2001 Dept. of Materials Science and Engineering, MIT. Ph.D.  
Title: Micromechanics of deformation and stress evolution in thin films and patterned lines on substrates; Advisor: Subra Suresh  
1992-1996 Dept. of Materials Science and Engineering, MIT, B.S.

### PROFESSIONAL HIGHLIGHTS

- 2006 SUNY Stony Brook Special Commendation for Graduate Teaching by Faculty
- 2005 NSF Faculty Early Career Award Recipient - "Multiscale and Multidisciplinary Aspects of Indentation"
- 2004 Departmental Teaching Award (Materials Science and Engineering, SUNY Stony Brook)
- National Institutes of Health Training Grant Postdoctoral Fellow 2001-2003
- First Prize, 2001 Bodycote Prize Paper Competition (with K.J. Van Vliet)
- 1996 MTS George Butzow Fellow

### RESEARCH ACTIVITIES

The role of stresses and strains in a number of different physical phenomena, including the nature of incipient plasticity in engineering and biological systems (most recently lung), as well as the initiation of fatigue in complex systems. Rapid pressurization and depressurization of fluids to create novel nanoscale structures. Development of analytical formulae for the indentation of complex systems. Design and construction of custom mechanical testing for highly compliant biological structures (e.g., organs, hydrogels). Emerging interests include the mechanics of eye, for studies of trauma during shaken baby syndrome.

### PUBLICATIONS

#### AS NORTHEASTERN UNIVERSITY FACULTY

- 1) Kim JH and **Gouldstone A.** Spherical Indentation of a Membrane on Elastic Half Space – in press, *Journal of Materials Research*.
- 2) Kim JH, Korach CS and **Gouldstone A.** Spherical Indentation of an Elastic Bilayer – a Modification of the Perturbation Approach – accepted to *Journal of Materials Research*.
- 3) Qu M and **Gouldstone A.** On the Role of Bubbles in Metallic Splat Nanopores and Adhesion – accepted to *Journal of Thermal Spray Technology* (cover art).
- 4) Weng LH, **Gouldstone A.**, Wu YH, Chen WL. Mechanically strong double network photocrosslinked hydrogels from N,N-dimethylacrylamide and glycidyl methacrylated hyaluronan. *Biomaterials* 2008;29:2153.
- 5) Choi WB, Wu Y, Sampath S and **Gouldstone A.** Modified Indentation Techniques to Probe Inelasticity in Ni-5%Al Coatings from Different Processes – accepted to *Journal of Thermal Spray Technology*.

## PREVIOUS APPOINTMENTS

- 6) Giannakopoulos A, Baxevanakis K, **Gouldstone A**. Finite element analysis of Volterra dislocations in anisotropic crystals: A thermal analogue. *Arch. Appl. Mech.* 2007;77:113.
- 7) Qu M, Wu Y, Srinivasan V, **Gouldstone A**. Observations of nanoporous foam arising from impact and rapid solidification of molten Ni droplets. *Appl. Phys. Lett.* 2007;90.
- 8) **Gouldstone A**, Chollacoop N, Dao M, Li J, Minor A, Shen Y. Indentation across size scales and disciplines: Recent developments in experimentation and modeling. *Acta Mat* 2007;55:4015.
- 9) Choi W, Li L, Luzin V, Neiser R, Gnaupel-Herold T, Prask H, Sampath S, **Gouldstone A**. Integrated characterization of cold sprayed aluminum coatings. *Acta Mat* 2007;55:857.
- 10) Gouldstone C, Wu Y, **Gouldstone A**. The geometric contribution to gauge factor of patterned lines on substrates. *Strain* 2007;43:306.
- 11) Li J, Longtin J, Tankiewicz S, **Gouldstone A**, Sampath S. Interdigital capacitive strain gauges fabricated by direct-write thermal spray and ultrafast laser micromachining. *Sens. & Act A* 2007;133:1.
- 12) Liu Y, Nakamura T, Srinivasan V, Vaidya A, **Gouldstone A**, Sampath S. Non-linear elastic properties of plasma-sprayed zirconia coatings and associated relationships with processing conditions. *Acta Mat* 2007;55:4667.
- 13) Sharma A, **Gouldstone A**, Sampath S, Gambino R. Anisotropic electrical conduction from heterogeneous oxidation states in plasma sprayed TiO<sub>2</sub> coatings. *J. Appl Phys* 2006;100.
- 14) Chollacoop N, Li L, **Gouldstone A**. Errors in resolved modulus during nano-indentation of hard films on soft substrates: A computational study. *Mat Sci Eng A* 2006;423:36.
- 15) Li L, Vaidya A, Streibl T, Sampath S, **Gouldstone A**, Luzin V, Prask H. Residual stress analysis of thermal sprayed molybdenum deposit. *Res Stress IV-Proc.* 2005;490-491:607.
- 16) Loring S, Brown R, **Gouldstone A**, Butler J. Lubrication regimes in mesothelial sliding. *J. Biomechanics* 2005;38:2390.
- 17) Hu S, Chen J, Fabry B, Numaguchi Y, **Gouldstone A**, Ingber D, Fredberg J, Butler J, Wang N. Intracellular stress tomography reveals stress focusing and structural anisotropy in cytoskeleton of living cells. *Am. J. Physiol – Cell Physiol* 2003;285:C1082.
- 18) **Gouldstone A**, Brown R, Butler J, Loring S. Elastohydrodynamic separation of pleural surfaces during breathing. *Resp Phys* 2003;137:97.
- 19) **Gouldstone A**, Brown R, Butler J, Loring S. Stiffness of the pleural surface of the chest wall is similar to that of the lung. *J. Appl. Phys.* 2003;95:2345.
- 20) **Gouldstone A**, Butler J, Brown R, Loring S. Sliding of lung over chest wall promotes separation of pleural surfaces. *Faseb J* 2002;16:A878.
- 21) Lai J, **Gouldstone A**, Butler J, Federspiel W, Loring S. Relative motion of lung and chest wall promotes uniform pleural space thickness. *Resp Phys* 2002;131:233.
- 22) Legros M, Hemker K, **Gouldstone A**, Suresh S, Keller-Flaig R, Arzt E. Microstructural evolution in passivated Al films on Si substrates during thermal cycling. *Acta Mat* 2002;50:3435.
- 23) **Gouldstone A**, Van Vliet K, Suresh S. Nanoindentation - Simulation of defect nucleation in a crystal. *Nature* 2001;411:656.
- 24) Van Vliet K, **Gouldstone A**. First prize - Mechanical properties of thin films quantified via instrumented indentation. *Surf Eng* 2001;17:140.
- 25) **Gouldstone A**, Koh H, Zeng K, Giannakopoulos A, Suresh S. Discrete and continuous deformation during nanoindentation of thin films. *Acta Mat* 2000;48:2277.

- 26) **Gouldstone A**, Wikstrom A, Gudmundson P, Suresh S. Onset of plastic yielding in thin metal lines deposited on substrates. *Scr Mat* 1999;41:297.
- 27) Keller-Flaig R, Legros M, Sigle W, **Gouldstone A**, Hemker K, Suresh S, Arzt E. In situ transmission electron microscopy investigation of threading dislocation motion in passivated thin aluminum films. *J Mater Res* 1999;14:4673.
- 28) **Gouldstone A**, Shen Y, Suresh S, Thompson C. Evolution of stresses in passivated and unpassivated metal interconnects. *J Mater Res* 1998;13:1956.

### PROCEEDINGS

- 1) Silva M, Hoyos M, Rooney JE and Gouldstone A. Indentation to Probe Atelectasis in the Mammalian Lung. *Proc MRS* 2006.
- 2) Liu Y, Nakamura T, Srinivasan V, **Gouldstone A** and Sampath S. Optimizing nonlinear properties of thermally sprayed coatings using process parameters. *Proc MRS* 2006.
- 3) Wu Y, Qu M, Giannuzi L, Sampath S, **Gouldstone A**. Focused Ion Beam Study of Ni5Al Single Splat Microstructure. *Proc MRS* 2006.
- 4) Choi WB, Kim JH and **Gouldstone A** – Inelasticity in Metallic TS Coatings – International Thermal Spray Conference, Seattle WA May 2006
- 5) Kim JH and **Gouldstone A** – Modeling Adhesion in TS Coatings – International Thermal Spray Conference, Seattle WA May 2006
- 6) Qu M and **Gouldstone A** – Deformation and Microstructure of TS Small-Volume Structures – International Thermal Spray Conference, Seattle WA May 2006
- 7) **Gouldstone A**, Prchlik L, Kulkarni A, Sampath S. Elastoplastic characterization of thermal spray coatings using instrumented indentation. Proceedings - 2004 International Thermal Spray Conference, Osaka, Japan.
- 8) Li L, **Gouldstone A**, Sampath S. Intrinsic properties of thermal sprayed single splats on substrates. Proceedings - 2004 International Thermal Spray Conference, Osaka, Japan.
- 9) Longtin JP, **Gouldstone A**, Sampath S, Gambino RJ, and Tankiewicz S, 2006, "Direct-Write Thermal Spray: A New Manufacturing Technology for Harsh Environment Sensors," 2006 NSF Design, Service, and Manufacturing Grantees and Research Conference, July 24–27, St. Louis MO.
- 10) Li J, Longtin JP, **Gouldstone A**, and Sampath S, "Modeling of Interdigital Capacitive Strain Gauges Fabricated Using Direct Write Technology," 2006 AIAA/ASME Ninth Joint Thermophysics and Heat Transfer Conference, June 5–8, San Francisco.
- 11) Li J, Longtin JP, Tankiewicz S, **Gouldstone A**, and Sampath S, "Characterization Of Interdigital Capacitive Strain Gauges By Direct Write Technology," *Proceedings of ASME National Heat Transfer Conference*, July 17–22, 2005, San Francisco, CA, Paper No. HT2005-72769.

### GRANTS & FUNDING

- 1) NSF Faculty Early Career: Multi-scale and Multidisciplinary Aspects of Indentation  
CMS Division: Total Award: \$400,000 (4/1/05 – 3/31/10) – Gouldstone PI
- 2) NSF Goal-IRG: Mechanics and Physics of Layered Interfaces  
Total Award: \$800,000 (9/1/06-8/31/09) - Co-PI: 33% (with S. Sampath and T. Nakamura)
- 3) NSF - SST: Enabling Concepts in Embedded Sensors, Sensor Manufacturing and Integration  
Total Award: \$750,000 (9/1/04 – 8/31/07) (with J. Longtin, S. Sampath, and R. Gambino)
- 4) SPIR – Mesoscribe Technologies - Behavior of Embedded Capacitive Strain Sensors

Total Award: \$34,158 (4/1/04 – 9/31/05) – Gouldstone PI

5) SPIR – Mesoscribe Technologies - Passive Detection of Damage and Strain in Aerospace Composites

Total Award: \$31,768 (4/1/04 – 9/31/05) – Gouldstone PI

6) SPIR – Mesoscribe Technologies - High Temperature Strain Gages

Total Award: \$18,335 (9/1/04/ - 12/31/05) – Gouldstone PI

### **INVITED TALKS**

- Indentation to Probe Physiology and Pathology of the Mammalian Lung – Program in Polymer Science and Technology, MIT, Feb 2008.
- Multiscale and Multidisciplinary Aspects of Indentation – three day seminar series in Singapore – invited by Institute of High Performance Computing (IHPC) - February 2007
- Micromechanics of Atelectasis in Lung - Rutgers University March 6, 2007
- Relevance of Nanoindentation to Wiresaw Slicing – NSF Workshop on High Pressure Phase Transformations – Kalamazoo MI, Aug 2006
- Mechanics of TS Coatings – Mitsubishi Corp, Orlando FL, July 2006
- Reliability and Wear of Hard TS Coatings – Caterpillar Inc, Peoria IL, July 2006
- Process Reliability in Plasma Sprayed Coatings – Presented at the Integrated Gas Turbine Workshop – Houston TX, Oct 2005
- Educating at the Nanoscale – Hillsborough County Middle Magnet School – Tampa FL
- Deformation Mechanisms in Sprayed Coatings –THERMAL BARRIER SYSTEMS: Joint Meeting of ONR-MURI and NSF-EU Programs, U of California, Santa Barbara, January 11-13, 2004
- Advanced Concepts in Characterization of Coatings and Small Volume Structures – Materials and Processes for Energy Systems – A Symposium Honoring Professor Herbert Herman, Stony Brook, NY, July 2004.
- Elastoplastic characterization of thermal spray coatings using instrumented indentation – Toshiba Heavy Industries, Tokyo Japan, May 2004.
- Elastoplastic characterization of thermal spray coatings using instrumented indentation: (Indentation: Past, Present and Future) – ASM Long Island., Smithtown, NY, March 2004.

### **CONFERENCE AND MEETING PRESENTATIONS**

\*\* In 2006 Gouldstone was the advisor on two oral presentations and one poster at the Fall MRS Conference in Boston, MA. In addition, Gouldstone was the advisor on three oral presentations at the ITSC Conference in Seattle, WA. Not explicitly listed here as Gouldstone himself did not speak.

1) Reliability of Hard Chrome Replacement Coatings – CTSR Industrial Consortium Meeting, Fall 2006, SUNY Stony Brook

2) Research Directions at SUNY Stony Brook – ITSA Meeting, Fall 2006, Hartford, CT

3) Mechanics and Physics of Layered Interfaces – Fall 2005 Materials Research Society Conference, December 2005, Boston MA

- 4) Nanoscale Deformation of Rapidly Quenched Structures on Substrates - Fall 2005 Materials Research Society Conference, December 2005, Boston MA
- 5) Inelastic Deformation Mechanisms of Thermal Sprayed Materials - Fall 2005 Materials Research Society Conference, December 2005, Boston MA
- 6) Advanced Indentation Techniques for Thermal Spray Coatings – CTSR Industrial Consortium Meeting, Fall 2005, SUNY Stony Brook
- 7) Multi-scale Mechanics of Lung Parenchyma– Spring 2005 Materials Research Society Conference, April 2005, San Francisco, CA
- 8) “Direct write capacitive strain sensors for structural health and damage monitoring” - Workshop on Bridging Direct Write Technology Dimensions, Seward, AK, July 2004.
- 9) Elastoplastic Characterization of Bondcoats – CTSR Industrial Consortium Meeting, Fall 2004, SUNY Stony Brook
- 10) “Interdisciplinary Aspects of Indentation” – MRSEC Director’s Mtg, Stanford, CA, Apr. 2003.
- 11) “Elastohydrodynamic Lubrication of Mesothelial Surfaces” – Federation of American Societies for Experimental Biology (FASEB) Meeting - San Diego, CA, Mar. 2003.
- 12) “Transient Fluid-Structure Modeling of Lubrication Between Lung and Chest Wall” – FASEB Meeting – New Orleans, LA, Mar. 2002.
- 13) “Computations of Lubrication in the Pleural Space” – First MIT Conference on Fluid and Solid Computational Modeling, Cambridge, MA, June 2001.
- 14) “Experimental Atomic Modeling of Nano-indentation” – MRS Conf., Boston, MA, Nov. 2000.
- 15) “Nano-indentation experiments on Thin Metal Films” – Gordon Conference on Thin Film Mechanics, Plymouth, NH, Aug 2000.
- 16) “Mechanical Properties of Thin Films via Instrumented Indentation” – BODYCOTE Prize Paper Competition, UK, Spring 2000 (with Krystyn Van Vliet.)
- 17) “Nano-indentation of Al Thin Films” – MRS Conference, Boston, MA, Nov. 1999.
- 18) “Analysis of Plastic Deformation in Patterned Metal Lines on Substrates” – MRS Conference, Boston MA, Nov. 1998.
- 19) “Computational Modeling of Stresses in Passivated and Unpassivated Metal Lines on Substrates” – MRS Conference, San Francisco, CA, Apr. 1997.

## **TEACHING ACTIVITIES**

- ESM 513 Strength of Materials - Graduate
- ESM 335 Strength of Materials - Undergraduate
- ESM 334 Materials Engineering - Undergraduate
- ESG 440/441 Senior Design Coordinating Instructor
- ITS 102 Freshman Seminar for Undergraduate College Program
- ESG 302 Thermodynamics -Undergraduate
- Six week experimental summer course in statics and dynamics (2006) -Undergraduate

## **CANDIDATE'S STUDENTS**

### **Advisor**

- Dr. W. Brian Choi (PhD 2008)
- Dr. Jae H. Kim (PhD 2008)
- Dr. Meng Qu (PhD 2008)
- Ms. Maricris R. Silva (PhD advisor – to qualify Fall 2008)
- Mr. Arash Ghabshi (Masters advisor 2008)
- Dr. Li Li (PhD Co-advisor 2005)

### **Committee Member**

- Dr. Atin Sharma (PhD Committee member, PhD 2006)
- Dr. Sumeet Bhagavat (PhD Committee member, PhD Mech E. 2006)
- Dr. Anirudha Vaidya (PhD Committee member, PhD 2005)
- Dr. Jingao Li (PhD Committee member, Mech E, PhD 2005)
- Ms. Guang Hua Wei (PhD Committee member, Mech E)
- Mr. MingYu Zhang (PhD Committee member, Mech E)
- Mr. Yang Tan (PhD Committee member, Mech E)
- Ms. Hui Chen (PhD Committee member)
- Mr. Alfredo Valarezo (PhD Committee member)
- Mr. Wesley Francillon (PhD Committee member)
- Mr. Weiguang Chi (PhD Committee Member)
- Ms. Melissa Butters (Masters Committee)
- Mr. Theophilou Theophilos (Masters Committee)
- Mr. Vasudevan Srinivasan (PhD Committee member)
- Ms. ShanShan Liang (PhD Committee member)
- Ms. Wei Zhang (PhD Committee member, Mech E)
- Ms. Yajie Liu (PhD Committee member, Mech E)
- Mr. Joo Choi (MS Committee member, Mech E)

### **Undergraduate Mentor**

- Ms. Leachien Ricks (Undergrad Mentor)
- Ms. Kimberly Ehret (Undergrad Mentor)
- Ms. Jordenne Nash (Undergrad Mentor)

### **High School Mentor**

- Ms. Melissa Hoyos (Syosset HS Mentor – now at Harvard)
- Ms. Theresa Squillante (Kings Park HS Mentor – now at RPI)
- Mr. Zachary Ingbreetsen (Kings Park HS Mentor – current)

- Mr. Andy Kim (Kings Park HS Mentor – current)
- Mr. Hal Mutlu (Kings Park HS Mentor – current)
- Mr. Justin Goldsmith (HHH East HS Mentor- CEAS Summer Research Institute – 2006)
- Mr. Christopher Russo (North Shore HS Mentor – 2005)

## **SERVICE CONTRIBUTIONS**

### **Campus (Stony Brook)**

- Advisor – NSBE (2004-present)
- Advisor – TBP (2005-present)
- Advisor – Materials Science Club (2003 – present)
- Advisor – SUNY Stony Brook ASM Student chapter (2004- present)
- Undergraduate Committee – Department of Materials Science and Engineering
- College of Engineering and Applied Sciences Curriculum & Teaching Policy Committee (2005-present) (currently chair)
- College of Arts and Sciences Curriculum Committee (2006-present) (CEAS Representative)
- Member - Turner Fellowship Advisory Committee
- Consistent Attendee at all student recruitment/orientation events

### **Outreach**

- Instructor, NSF Research Experience for Teachers (2004-2005)
- Advisor, NSF Research Experience for Undergraduates/High School (2004-present)
- Presenter, NSF K-12 Outreach (Center for Thermal Spray Research) (2004-present)
- Instructor, Johns Hopkins Center for Talented Youth (2004)

### **Professional**

- ASM Long Island Chapter – Executive Board 2005-present, Vice-Chair 2006-present
- Abstract Editor, Journal of Thermal Spray Technology
- Reviewer for the Following Journals:

*Wear*

*Journal of Materials Science and Technology*

*Materials Science and Engineering A*

*Thin Solid Films*

*Journal of Materials Processing Technology*

*Metallurgical Transactions A* ('Excellent Reviewer' Rating 2006)

- Reviewer: Cambridge University Press
- NSF Reviewer: Civil and Mechanical Systems

## **PROFESSIONAL MEMBERSHIPS**

- Materials Research Society (MRS)
- Materials Information Society (ASM)
- Thermal Spray Society (TSS)
- Tau Beta Pi (MIT Chapter)
- American Society for Engineering Education