

JIAN CAO

Cardiss Collins Professor, Department of Mechanical Engineering
and (by courtesy) Civil and Environmental Engineering
Director, Northwestern Initiative on Manufacturing Science & Innovation
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Prof. Cao's major research interests include innovative manufacturing processes and systems, particularly in the area of deformation-based processes and laser processes. Her work has made fundamental contributions to the understanding of wrinkling in sheet forming and the effects of material microstructure and material architecture on forming behavior of metals and woven composites. Her research has integrated analytical and numerical simulation methods, control and sensors, design methodologies to advance manufacturing processes. Her research group has designed unique manufacturing equipment for microforming, flexible rapid forming, and additive manufacturing. Current research on flexible dieless forming, micro-forming, laser processes for ablation and additive, and composites forming has direct impacts on energy-efficient manufacturing, surface engineering and rapid prototyping. She has published over 300 technical articles, including more than 160 journal articles, 10 book chapters, and 13 patents. She has given over 120 invited talks.

Prof. Cao's research contributions have been recognized by honors and awards given by her peers in the field of manufacturing, applied mechanics and control. She is a Fellow of the *International Academy for Production Engineering (CIRP)*, *Society of Manufacturing Engineers (SME)*, and *American Society of Mechanical Engineers (ASME)*. Her awards include ASME and Pi Tau Sigma Charles Russ Richards Memorial Award; SME Frederick W. Taylor Research Medal, ASME literature award – Blackall Machine Tool and Gage Award; ASME/AMD Young Investigator Award; and NSF CAREER award. Prof. Cao is the founding Technical Editor of the *ASME Journal of Micro- and Nano-manufacturing*. In 2012, she was selected to be the panelist representing the field of manufacturing in the World Technology Evaluation (WTEC) study on Societal Convergence for Human Progress: Beyond Convergence of Nano-Bio-Info-Cognitive Technologies, sponsored by NSF, NIH, NASA, EPA, DoD, and DoA; and the WTEC study on Systems Engineering for Clean and Renewable Energy Manufacturing. Her research partners have included both large corporations and small-medium corporations.

Prof. Cao has been active at the national and international stages. She served as the Program Director of Materials Processing and Manufacturing (MPM) program at NSF from 2003 to 2005. During that short two-year period, under her leadership, the WTEC Study on Micro-manufacturing was conducted and co-sponsored by four government agencies and more than ten NSF programs. She co-initiated the joint-funding between NSF and DOE for her MPM program. Through collaborating with other programs, she was able to increase the funding of her program by over 20%. She is one of the main driving forces behind the well-received NSF workshops on CAREER development. Prof. Cao served as President of North American Manufacturing Research Institute of SME and Chair of ASME Manufacturing Engineering Division. She has chaired multiple ASME committees, including M. Eugene Merchant Medal Committee and Committee of Administration and Finance. She was awarded the ASME

Dedicated Service Award. She is the Chair of the Scientific and Technical Committee on Forming and the Vice-Chair of the Working Group on Additive Manufacturing of *CIRP*.

As an Associate Vice President for Research at Northwestern, Prof. Cao oversees the unit that administers the university's core facilities. Working with faculty, staff and leadership at schools and the university, she successfully launched new funding models for key scientific instruments and software, and led initiatives for strengthening major supporting units, such as machine shop, electronics shop and clean rooms. Additionally, several University Research Centers report to her, primarily in the physical sciences and engineering. Prof. Cao helps with the collaboration between the physical sciences and engineering and the other disciplines across and beyond Northwestern. She is the founding director of Northwestern Initiative on Manufacturing Science and Innovation, aiming to undertake multi-disciplinary research and education initiatives associated with manufacturing across the broad spectrum that impact both mass-production manufacturing and emerging hyper-customized and personalized manufacturing. Cao is a member of the Technical Advisory Board of Digital Manufacturing and Design Innovation Institute (DMDII).

PROFESSIONAL EXPERIENCE

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| Cardiss Collins Professor, Northwestern University | Sept. 2016 - present |
| Professor, Mechanical Engineering, Northwestern Univ. | Sept. 2008 – present |
| Associate Vice President for Research, Northwestern University | Oct. 2012 – present |
| Director, Northwestern Initiative for Manufacturing Science and Innovation (NIMSI) | April 2015 - present |
| Senior Institute Fellow, Argonne National Laboratory | March 2016 – August 2018 |
| Founder Scimplicity LLC | Nov. 2011 – present |
| Co-Director, NSF Summer Institute on Nanomechanics, Nanomaterials, and Micro/Nanomanufacturing | Oct. 2007 – Sept. 2013 |
| Director, Graduate Studies, Mechanical Engineering | Sept. 2007 – Sept. 2012 |
| Professor, Civil and Environmental Eng., Northwestern | May 2010 – present |
| Associate Professor, Mechanical Engineering, Northwestern Univ. | Sept. 2002 – Aug. 2008 |
| Interim Asso. Chair, Mechanical Engineering, Northwestern Univ. | Sept. 2006 - Aug. 2007 |
| Program Director, National Science Foundation | Sept. 2003 – Sept. 2005 |
| Assistant Professor, Mechanical Engineering, Northwestern Univ. | Sept. 1995 - Aug. 2002 |
| (Industrial training at General Motors Corp. | Sept. 1995 - June 1996) |
| Postdoctoral Fellow, Mechanical Engineering, M.I.T. | Feb. 1995 - July 1995 |

EDUCATION

Ph.D. Mechanical Engineering, *Massachusetts Institute of Technology*, 1995
Thesis: Design and Control of Forming Parameters for Sheet Metal Forming Using Finite Element Analysis
Thesis Advisor: Professor Mary C. Boyce

M.S. Mechanical Engineering, *Massachusetts Institute of Technology*, 1992
Thesis: Drawbead as a Control Element of Material Flow during Sheet Metal Forming
Thesis Advisor: Professor Mary C. Boyce

B.S. Materials Science and Engineering, *Shanghai JiaoTong University*, 1989

B.S. Automatic Control, *Shanghai JiaoTong University*, 1989

HONORS AND AWARDS

Charles Russ Richards Memorial Award, ASME and Pi Tau Sigma, 2017, to recognize the outstanding achievement in mechanical engineering by graduating 20 years or more.

Frederick W. Taylor Research Medal, *Society of Manufacturing Engineers*, 2016

Fellow, *The International Academy for Production Engineering (CIRP)*, 2014

STLE Best Paper Award, 2014, among all the papers published in 2013 by STLE's associated journals in the field of surface engineering, *Society of Tribologists and Lubrication Engineers*, 2014 – "Surface Texturing of Drill Bits for Adhesion Reduction and Tool Life Enhancement".

ISFA Best Application Paper Award at the *ISFA 2014* – "Design and evaluation of an embedded pressure sensor for microrolling process monitoring", Awaji-Island, Hyogo, Japan

Distinguished Service Award, *ASME Manufacturing Engineering Division*, 2013.

ASME Blackall Machine Tool and Gage Award, 2012 – Best Journal Paper Award "An Investigation on Deformation-based Micro Surface Texturing".

ASME Dedicated Service Award, 2011

Fellow, *Society of Manufacturing Engineers*, 2010

Distinguished Service Award, *ASME Manufacturing Engineering Division*, 2009.

Best Poster Award, *ASME Manufacturing Science and Engineering Conference*, 2008, "Deformation Machining: A New Hybrid Process", Woody, B., Smith, K.S., Cao, J., Ziegert, J., Belytschko, T., Foecke, T. and Li, M

Fellow, *American Society of Mechanical Engineers*, 2007

Young Investigator Award, *American Society of Mechanical Engineers/Applied Mechanics*, 2006

Outstanding Young Investigator Award, *Japan-US Flexible Automation*, 2002

Outstanding Young Manufacturing Engineer Award, *Society of Manufacturing Engineers*, 2002

Ralph R. Teetor Educational Award, *SAE International*, 1999

CAREER Award, *National Science Foundation*, 1997-2001

ALCOA Foundation award, 1997

General Electric Chair Professor, endowed Assistant Professor Chair, Northwestern University, 1996-1997

EDITORSHIPS

Technical Editor, *ASME Journal of Micro- and Nano-Manufacturing (JMNM)*, January 2012 – December 2021. Selected to be included in the Thomson Reuters Emerging Sources Citation Index 2016.

Editor, *International Journal of Precision Engineering and Manufacturing*, Jan. 2011 – Dec. 2011

Associate Editor, *ASME Journal of Manufacturing Science and Engineering*, April 2003 – 2009.

Associate Editor, *ASME Journal of Applied Mechanics*, October 2005 – October 2011.

Scientific Committee, *International Journal of Materials Forming*, Springer, October 2007 – present.

Member, International Editorial Advisory Board of *Chinese Journal of Mechanical Engineering-English Edition*, distributed by ASME, October 2001 – present.

REFEREED JOURNAL ARTICLES

1. Wolff, S. J., Lin, S., Faierson, E. J., Liu, W.K., Wagner, G. L. and Cao, J. (2017) "A framework to link localized cooling and properties of directed energy deposition (DED)-processed Ti-6Al-4V", *Acta Materialia*, Vol. 132, pp.106-117, <http://dx.doi.org/10.1016/j.actamat.2017.04.027>.
2. Wang, X.W., Xu, J., Shan, De.B., Guo, B. and Cao, J. (2017) "Effects of specimen and grain size on electrically-induced softening behavior in uniaxial micro-tension of AZ31 magnesium alloy: Experiment and modeling", *Materials and Design*, Vol. 217, pp.134-132, <http://dx.doi.org/10.1016/j.matdes.2017.04.064>.
3. Lee, T.Y., Magargee, J., Ng, M.K. and Cao, J. (2017) "Constitutive analysis of electrically-assisted tensile deformation of CP-Ti based on non-uniform thermal expansion, plastic softening and dynamic strain aging", *Int. J. Plasticity*, 2017.
4. Cao, T., Lu, B., Cao, J. and Chen, J. (2017) "Experimental investigations on the forming mechanism of a new incremental stretch-flanging strategy with a featured tool", to appear *Int. J. Advanced Manufacturing Technology*.
5. Zhang, W., Ren, H., Liang, B., Zeng, D., Su, X., Dahl, J., Mirdamadi, M., Zhao, Q., and Cao, J. (2017) "A non-orthogonal material model of woven composites in the preforming process", to appear *CIRP Annals – Manufacturing Technology*.
6. Huang, J., Yuan, Y., Liu, H. and Cao, J. (2016) "Mechanical Behavior Characterization of Magnesium Alloy Sheets at Warm Temperature", *J. Mechanics*, Vol. 32(4), pp.391-399, [doi.org/10.1017/jmech.2015.101](http://dx.doi.org/10.1017/jmech.2015.101).
7. Wang, X.W., Xu, J., Shan, D. Guo, B. and Cao, J. (2016) "Modeling of thermal and mechanical behavior of a magnesium alloy AZ31 during electrically-assisted micro-tension", *Int. J. Plasticity*, Vol. 85, pp.230-257, <http://dx.doi.org/10.1016/j.ijplas.2016.07.008>.
8. Ng, M.K., Saxena, I., Ehmann, K.F. and Cao, J. (2016) "Improving surface hydrophobic performance by micro-rolling based-texturing", *J. of Micro- and Nano-manufacturing*, Vol. 4, 031001 (8 pages), DOI: 10.1115/1.4033680.
9. Moser, N., Pritchett, D., Ren, H.Q., Ehmann, K.F. and Cao, J. (2016) "An efficient and general finite element model for double-sided incremental forming", *ASME J. of Manufacturing Science and Engineering*, Vol. 138, September, 091007 (10 pages), [doi:10.1115/1.4033483](http://dx.doi.org/10.1115/1.4033483).
10. Allwood, J. M., Duncan, S. R., Cao, J., Groche, P., Hirt, G., Kinsey, B., Kuboki, T., Liewald, M., Sterzing, A. and Tekkaya, A.E. (2016) "Closed-loop control of product properties in metal forming", *Annals of CIRP*, Vol. 66 (2), pp.573-596, dx.doi.org/10.1016/j.cirp.2016.06.002.
11. Wang, X., You, Y., Liu, T.C., Liu, C., Ulmer, M. and Cao, J. (2016) "Deformation of rectangular thin glass plate coated with magnetostrictive material", *Smart Materials and Structures*, Vol. 25(8), 085038, <http://dx.doi.org/10.1088/0964-1726/25/8/085038>.
12. Sah, S., Mahayotsanun, N., Peshkin, M., Cao, J. and Gao, R.X. (2016) "Pressure and Draw-in Maps for Stamping Process Monitoring", *ASME J. Manufacturing Science and Engineering*, Vol. 138(9), 091005 (15 pages), [doi: 10.1115/1.4033039](http://dx.doi.org/10.1115/1.4033039).
13. Davarpanah, M.A., Zhang, Z.X., Bansal, S., Cao, J. and Malhotra, R. (2016) "Preliminary Investigations on Double Sided Incremental Forming of Thermoplastics", *Manufacturing Letters*, Vol. 8, pp.21-26, <http://dx.doi.org/10.1016/j.mfglet.2016.05.003>
14. Huang, J., Yuan, Y., Liu, H. and Cao, J. (2016) "Mechanical Behavior Characterization of Magnesium Alloy Sheets at Warm Temperature", *J. Mechanics*, Vol. 32(4), pp.391-399, [doi.org/10.1017/jmech.2015.101](http://dx.doi.org/10.1017/jmech.2015.101).
15. Xing, Y.Q., Deng, J.X., Wang, X.S., Ehmann, K. and Cao, J. (2016) "Experimental Assessment of Laser Textured Cutting Tools in Dry Cutting of Aluminum Alloys," *ASME J.*

Manufacturing Science and Engineering, 138(7):071006-071006-10, doi: 10.1115/1.4032263.

16. Xu, D.K., Lu, B., Cao, T.T., Zhang, H., Chen, J., Long, H. and Cao, J. (2016) "Enhancement of Process Capabilities in Electrically-assisted Double Sided Incremental Forming", *Materials and Design*, Vol. 92, pp. 268-280, <http://dx.doi.org/10.1016/j.matdes.2015.12.009>.
17. Moser, N., Zhang, Z.X., Ren, H., Zhang, H., Shi, Y., Ndip-Agbor, E. E., Lu, B., Chen, J., Ehmann, K. and Cao, J. (2016) "Effective Forming Strategy for Double-Sided Incremental Forming Considering In-plane Curvature and Tool Direction", *Annals of CIRP*, Vol. 66 (1), 10.1016/j.cirp.2016.04.131.
18. Valoppi, B., Egea, A.J.S., Zhang, Z.X., Rojas, H.A.G., Ghiotti, A., Bruschi, S. and Cao, J. (2016) "A Hybrid Mixed Double-Sided Incremental Forming Method for Forming Ti6Al4V Alloy", *Annals of CIRP*, Vol. 66 (1), 10.1016/j.cirp.2016.04.135.
19. Wang, X.W., Xu, J., Jiang, Z.L., Zhu, W.L., Shan, D.B., Guo, B. and Cao, J. (2016) "Size Effects on Flow Stress Behavior during Electrically-assisted Micro-tension in a Magnesium Alloy AZ31", *Materials Science and Engineering: A*, Vol. 659, pp. 215-224, 10.1016/j.msea.2016.02.064.
20. Smith, J., Xiong, W., Yan, W., Lin, S., Cheng, P., Kafka, O.L., Wagner, G.J., Cao, J., Liu, W.K. (2016) "Linking process, structure, property, and performance for metal-based additive manufacturing: computational approaches with experimental support", *Computational Mechanics*, DOI: 10.1007/s00466-015-1240-4.
21. Smith, J., Xiong, W., Cao, J. and Liu, W.K. (2016) "Thermodynamically Consistent Microstructure Prediction of Additively Manufactured Materials", *Computational mechanics*, DOI:10.1007/s00466-015-1243-1, ISSN 0178-7675.
22. Zeng, Q., Ehmann, K.F. and Cao, J. (2016) "Design of General Kinematotropic Mechanisms", *Robotics and Computer-Integrated Manufacturing*, Vol. 38, pp.67-81, <http://dx.doi.org/10.1016/j.rcim.2015.10.005>.
23. Zeng, Q., Ehmann, K.F. and Cao, J. (2016) "Tri-pyramid Robot: Stiffness Modeling of a 3-DOF Translational Parallel Manipulator", *Robotica*, DOI: 10.1017/S0263574714001520, Vol. 34(2), pp. 383-402.
24. Nguyen-Tran, H.D., Oh, H.S., Hong, S.T., Han, H.N., Cao, J., Ahn, S.H. and Chun, D.M. (2015) "A review of electrically-assisted manufacturing", *International Journal of Precision Engineering and Manufacturing - Green Technology*, 2(4), pp. 365–376, DOI: 10.1007/s40684-015-0045-4.
25. Saxena, I., Malhotra, R., Ehmann, K. and Cao, J. (2015) "High-speed Fabrication of Micro-channels using Line-based Laser Induced Plasma Micro-machining (L-LIPMM)", *Journal of Micro and Nano-Manufacturing*, 2015, Vol. 3.
26. Saxena, I., Liu, J., Ehmann, K., Cao, J. (2015) "Periodic Surface Pattern Fabrication via Biprism Interference Micro-machining", *Journal of Surface Topography: Metrology and Properties*, Oct. 27, 2015, 045006, doi:10.1088/2051-672X/3/4/045006.
27. Martinez-Prieto, N., Abecassis, M., Xu, J., Guo, P., Cao, J., Ehmann, K., (2015) "Feasibility of Fiber-deposition Control by Secondary Electric Fields in Near-Field Electrospinning," *ASME Journal of Micro and Nano Manufacturing*, Vol. 3(4), 041005, Sept. 22, 2015, doi: 10.1115/1.4031491.
28. Smith, J., Liu, W.K. and Cao, J. (2015) "A General Anisotropic Yield Criterion for Pressure-dependent Materials", *Int. J. Plasticity*, Vol. 75, pp. 2 – 21, 10.1016/j.ijplas.2015.08.009.
29. Zhang, Z., Ren, H., Xu, R., Moser, N., Smith, J., Ndip-Agbor, E., Malhotra, R., Xia, Z.C., Ehmann, K.F. and Cao, J. (2015) "A Mixed Double-Sided Incremental Forming Toolpath Strategy for Improved Geometric Accuracy", *ASME Journal of Manufacturing Science and Engineering*, Vol.137(5), 051007 (7 pages), doi: 10.1115/1.4031092.
30. Ren, H., Moser, N., Zhang, Z., Ndip-Agbor, E., Smith, J., Ehmann, K. and Cao, J. "Effects of Tool Positions in Accumulated Double-Sided Incremental Forming on Part Geometry",

- ASME Journal of Manufacturing Science and Engineering*, 137(5), 051008 (Sep 04, 2015) (8 pages), doi: 10.1115/1.4030528.
31. Yao, Y., Wang, X., Cao, J. and Ulmer, M. (2015) "Stress manipulated coating for fabricating light weight X-ray telescope mirrors", *Optics Express*, 23(22), 28605-18. doi: 10.1364/OE.23.028605
 32. Ng, M.K., Li, L.Y., Fan, Z.Y., Gao, R.X., Smith, E.S. III, Ehmann, K.F. and Cao, J. (2015) "Joining sheet metals by electrically-assisted roll bonding", *Annals of CIRP*, Vol. 65(1), pp. 273-276, doi:10.1016/j.cirp.2015.04.131.
 33. Li, Z.F., Ding, W., Cao, J., Ye, L.Y. and Chen, J. (2015) "In Situ TEM Observation on Martensitic Transformation during Tensile Deformation of SUS304 Metastable Austenitic Stainless Steel", *Acta Metall. Sin. (Engl. Lett.)*, Vol. 28(3), pp.302-306, DOI:10.1007/s40195-014-0197-1.
 34. Tekkaya, A.E., Allwood, J.M., Bariani, P.F., Bruschi, S., Cao, J., Gramlich S., Groche P., Hirt, G., Ishikawa, T., Merklein, M., Misiolek, W., Pietrzyk, M., Shivpuri, R. and Yanagimoto, J. (2015) "Metal Forming Beyond Shaping: Predicting and Setting Product Properties", *Annals of CIRP*, Vol. 64(2), 629–653.
 35. Xu, D., Ng, M.K., Fan, R., Zhou, R., Wang, H.-P., Chen, J. and Cao, J. (2015) "Enhancement of Adhesion Strength by Micro-rolling-based Surface Texturing", *Int. J. Advanced Manufacturing Technology*, Vol. 78 (9-12), pp 1427-1435, doi:10.1007/s00170-014-6736-0.
 36. Moser, N., Ndip-agbor, E., Ren, H., Zhang, Z., Ehmann, K., & Cao, J. (2015). Challenges and Process Strategies Concerning Multi-Pass Double Sided Incremental Forming. *Key Engineering Materials*, 651-653, 1122–1127. doi:10.4028/www.scientific.net/KEM.651-653.1127.
 37. Ndip-Agbor, E.E., Smith, J., Ren H., Jiang, Z., Moser, N., Chen, W. Xia, Z.C. and Cao, J. (2015) "Optimization of Relative Tool Position in Accumulative Double Sided Incremental Forming using Finite Element Analysis and Model Bias Correction", *Int. J. Material Forming*, DOI:10.1007/s12289-014-1209-4.
 38. Zou, X., Fan, Z., Gao, R.X., Ng, M.K. and Cao, J. (2015) "An Integrative Approach to Spatial Mapping of Pressure Distribution in Microrolling", *CIRP J. Manufacturing Science and Technology*, Vol. 9, pp. 107-115, doi:10.1016/j.cirpj.2014.12.002.
 39. Saxena, I., Ehmann, K. and Cao, J. (2015) "High Throughput Microfabrication using Laser Induced Plasma in Saline Aqueous Medium", *J. Materials Processing Technology*, Vol. 217, March, pp. 77–87, doi:10.1016/j.jmatprotec.2014.10.018.
 40. Fan, Z., Zou, X., Gao, R.X., Ng, M.K., Cao, J. and Smith, E.F. (2015) "Embedded Capacitive Pressure Sensing for Electrically Assisted Microrolling", *IEEE/ASME Transactions on Mechatronics, Focused Section on Mechatronics for Intelligent Manufacturing*, Vol. 20, No. 3, pp.1005-1014. DOI: 10.1109/TMECH.2014.2365512.
 41. Aktürk, D.Z., Liu, P., Cao, J., Wang, Q.J., Xia, Z.C., Talwar, R., Grzina, D., and Merklein, M. (2015) "Friction Anisotropy of Aluminum 6111-T4 Sheet with Flat and Laser-Textured D2 Tooling", *Tribology International*, Vol. 81, pp. 333-340, DOI: 10.1016/j.triboint.2014.09.001.
 42. Cao, T.T., Lu, B., Xu, D.K., Zhang, H., Chen, J., Long, H. and Cao, J. (2015) "An efficient method for thickness prediction in multi-pass incremental sheet forming", *Int. J. Advanced Manufacturing Technology*, Vol. 77(1-4), pp. 469-483., DOI 10.1007/s00170-014-6489-9.
 43. Lu, B., Fang, Y., Xu, D.K., Chen, J., Ai, S., Long, H., Ou, H. and Cao, J (2015) "Investigation of material deformation mechanism in double side incremental sheet forming", *Int. J. Machine Tools and Manufacture*, Vol.93, pp.37-48, doi:10.1016/j.ijmachtools.2015.03.007.
 44. Saxena, I., Wolff, S. and Cao, J. (2015) "Unidirectional magnetic field assisted Laser Induced Plasma Micro-Machining", *Manufacturing Letters*, Vol. 3, pp.1-4.

45. Zeng, Q., Ehmann, K.F. and Cao, J. (2014) "Tri-pyramid Robot: Design and kinematic analysis of a 3-DOF translational parallel manipulator", *Robotics and Computer-Integrated Manufacturing*, Vol. 30(6), pp. 648-657, doi:10.1016/j.rcim.2014.06.002.
46. Saxena, I, Ehmann, K. and Cao, J. (2014) "Laser-induced plasma in aqueous media: numerical simulation and experimental validation of spatial and temporal profiles", *Applied Optics*, Vol. 53(35), pp. 8283-8294, dx.doi.org/10.1364/AO.53.008283.
47. Wang, X., Knapp, P., Vaynman, S., Graham, M.E., Cao, J., Ulmer, M.P. (2014) 'Experimental study and analytical model of deformation of magnetostrictive films as applied to mirrors for X-ray space telescopes", *Applied Optics*, Vol. 53(27), pp.6256-6267, dx.doi.org/10.1364/AO.53.006256.
48. Lu, B., Fang, Y., Xu, D.K., Chen, Ou, H., Moser, N.H. and Cao, J. (2014) "Mechanism investigation of friction-related effects in single point incremental forming using a developed oblique roller-ball tool", *Int. J. Machine Tools and Manufacture*, Vol. 85, pp.14-29, DOI: 10.1016/j.ijmactools.2014.04.007.
49. Bruschi, S., Altan, T., Banabic, D., Bariani, P.F., Brosius, A., Cao, J., Ghiotti, J., Khraisheh, M., Merklein, M. and Tekkaya, E. (2014) "Testing and Modelling of Material Behavior and Formability in Sheet Metal Forming Processes", *Annals of CIRP*, Vol.63/2, pp.727-749. Dx.doi.org/10.10106/j.cirp.2014.05.005.
50. Guo, P., Lu, Y., Ehmann, K.F. and Cao, J. (2014) "Generation of hierarchical micro-structures for anisotropic wetting by elliptical vibration cutting", *Annals of CIRP*, Vol.63/1, pp.553-556, http://dx.doi.org/10.1016/j.cirp.2014.03.048.
51. Ng, M-K, Fan, Z., Gao, R.X., Smith, E.F., Cao (2014) "Characterization of electrically-assisted micro-rolling for surface texturing using embedded sensor", *Annals of CIRP*, Vol.63/1, pp. 269-272, http://dx.doi.org/10.1016/j.cirp.2014.03.021.
52. Xu, R., Shi, X.T., Xu, D.K, Malhotra, R. and Cao, J. (2014) "A preliminary study on the fatigue behavior of sheet metal parts formed with accumulative-double-sided incremental forming", *Manufacturing Letters*, http://dx.doi.org/10.1016/j.mfglet.2013.10.009.
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54. Magargee, J., Fan, R. and Cao, J. (2013) "Analysis and Observations of Current Density Sensitivity and Thermally Activated Mechanical Behavior in Electrically-Assisted Deformation", *ASME J. Manufacturing Science and Engineering*, Vol. 135, 061022 (8 pages), DOI: 10.1115/1.4025882.
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56. Beltran, M., Malhotra, R., Nelson, A.J., Bhattacharya, A., Reddy, N.V., and Cao, J. (2013). "Experimental study of failure modes and scaling effects in micro-incremental forming", *ASME Journal of Micro- and Nano-manufacturing*, Sept, Vol. 1, 031005-1, doi:10.1115/1.4025098
57. Xu, D.K; Wu, W.C., Malhotra, R., Chen, J., Lu, B. and Cao, J. (2013) "Mechanism Investigation for the Influence of Tool Rotation and Laser Surface Texturing (LST) on Formability in Single Point Incremental Forming", *International Journal of Machine Tools and Manufacture*, Vol. 73, pp. 37-46, 10.1016/j.ijmactools.2013.06.007.
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60. Fan, R., Magargee, J., Hu, P. and Cao, J. (2013) "Influence of Grain Size and Grain Boundaries on the Thermal and Mechanical Behavior of 70/30 Brass under Electrically-Assisted Deformation", *Materials Science & Engineering A*, Vol.574(1), pp.218-225, 10.1016/j.msea.2013.02.066.
61. Mitsuishi, M., Cao, J., Bártolo, P., Friedrich, D., Shih, A., Rajurkar, K., Sugita, N. and Harada, K. (2013) "Biomanufacturing", *Annals of CIRP*, Vol.62/2, pp.585-606, <http://dx.doi.org/10.1016/j.cirp.2013.05.001>.
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78. Cao, J., Krishnan, N, Mori, L. and Espinosa H.D. (2006) "Experimental Investigation of the Size Effects Observed in the Extrusion of Micropins", *1st International Conference on Micromanufacturing*, Urbana, Illinois, 2006.
79. Mahayotsanum, N., Cao, J. and Peshkin, M. (2006) "Characterization of a Draw-in Sensor Built on the Principle of Mutual Inductance", *International Symposium on Flexible Automation*, Osaka, Japan.
80. Liu, L, Chen, J., Zhu, B., Yu, T.X., Tao, X.M., and Cao, J. (2006) "The Yarn-to-Yarn Friction of Woven Fabric", *ESAFORM 2006*, Glasgow, U.K.
81. Buranathiti, T., Cao, J., Xia, Z.C. and Chen, W. (2005) "Probabilistic Design in a Sheet Metal Stamping Process under Failure Analysis", *NUMISHEET*, Detroit, MI.
82. Mahayotsanun, N., Cao, J. and Peshkin, M. (2005) "A Draw-In Sensor for Process Control and Optimization", *NUMISHEET*, Detroit, MI.
83. Krishnan, N., Cao, J., Kinsey, B., Parasiz, S.A. and Li, M. (2005) "Investigation of Deformation Characteristics of Micropins Fabricated Using Microextrusion", *IMECE 2005*, Orlando, FL.
84. Krishnan, N., Cao, J. and Dohda, K. (2005) "Microforming: Study of Friction Conditions and the Impact of Low Friction/High Strength Die Coatings on the Extrusion of Micropins", *IMECE 2005*, Orlando, FL.
85. Hang Shawn Cheng, Jian Cao, Numpon Mahayotsanun (2005) "Experimental Study on Woven Composites with Different Temperature Trajectories", *ESAFORM Conference*, April, 2005.
86. Krishnan, N., Cao, J., Ehmann, K. F. and Owusu-Ofori, S. (2004) "Microforming: Study of grain size and friction effects in the extrusion of micropins", *4th International Workshop on Microfactories*, Shanghai, China, October 15-17, 2004.
87. Krishnan, N. and Cao, J. (2004) "Experimental Investigation and Comparison of Variable Blank-holder Force Trajectories Using an ARMA Model", *JUSFA 2004*, July 19-21, Denver, Colorado.
88. Liu, W.K., Cao, J. Lu, H.S. and Krishnan, N. (2004) "A Multi-scale Simulation of Microforming Process Using RKEM", *NUMIFORM 2004*, June 13-17, Columbus, OH.
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93. Cao, Peng, X.Q., Cao, J., Chen, J. (2003) "Stamping Simulation of Woven Composites Using a Non-orthogonal Constitutive Model", *ESAFORM Conference on Material Forming*, Italy.
94. Cheng, H.S., Lu, H., Cao, J. and Liu, W.K. (2003) "Characterization of Wrinkling: Experiments and Simulations", *ESAFORM Conference on Material Forming*, Italy.
95. Krishnan, N., Cao, J., (2002) "Estimation of Optimal Blank Holder Force Trajectories in Segmented Binders Using an ARMA Model", *Proceedings of the JSME/ASME Conference on Materials and Processing*, Oct 15-18, 2002-Honolulu, Hawaii.
96. Peng, X.Q., Xue, P., Cao, J., Lussier, D. and Chen, J. (2002) "Normalization in the Picture Frame Test of Woven Composites: Length or Area?", *ESAFORM Conference on Material Forming*, Krakow, Poland.
97. Baghdasaryan, L., Chen, W., Buranathiti, T. and Cao, J. (2002) "Model Validation via Uncertainty Propagation using Response Surface Models", *2002 ASME Design Engineering Technical Conferences*, Montreal, Canada.
98. Buranathiti, T. and Cao, J., Baghdasaryan, L., Chen, W., (2002) "An Approach for Model Validation in Simulating Sheet Metal Forming Processes", *International Conference on Frontiers of Design and Manufacturing*, Dalian, China
99. Krishnan, N and Cao, J. (2002) "Real-time Calculation of Optimal Blank-holder Force History in Sheet Metal Forming Using an ARMA Model", *2002 Japan US Symposium on Flexible Automation*, Hiroshima, Japan.
100. Li, S.P. and Cao, J (2001) "Enhancement of Coil Stiffness Using a Cardboard Core", *2001 International Mechanical Engineering Congress and Exposition*, New York, NY.
101. Peng, X.Q. and Cao, J. (2001) "Sensitivity Study on Material Characterization of Textile Composite", *the First M.I.T. Conference on Computational Fluid and Solid Mechanics*, Cambridge, Massachusetts, June 12 - 14, 2001.
102. Kinsey, B.L. and Cao, J. (2001) "Numerical Simulation and Experimental Implementation of Tailor Welded Blank Forming", *Second Global Conference on Processing & Manufacturing of Sheet Metals, 2001 TMS Annual Meeting*, New Orleans, Louisiana, February 11-15, 2001.
103. Peng, X.Q., Lussier, D., Cao, J. and Chen, J. (2001) "Material Behavior Characterization of Textile Composite Sheets: Experiments and Simulation", *Second Global Conference on Processing & Manufacturing of Sheet Metals, 2001 TMS Annual Meeting*, New Orleans, Louisiana, February 11-15, 2001.
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105. Peng, X.Q. and Cao, J. (2000) "Numerical Determination of Mechanical Elastic Constants of Textile Composites", *15th Annual Technical Conference of the American Society for Composites*, College Station, Texas, Sept. 25-27, 2000.
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107. Cao, J., Kinsey, B.L., Song, N. and Yao, H. (2000) "Next Generation Stamping Dies - Flexibility and Controllability", *International Conference of Flexible Automation & Intelligent Manufacturing*, College Park, Maryland.

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111. Cao, J., Karafillis, A. and Boyce, M. "Prediction of Forming Limit Diagram using KB yield Criterion", *International Symposium on Plasticity and its Current Applications*, 1997.
112. Kinsey, B. and Cao, J. "An Experimental Study to Determine the Feasibility of Implementing Process Control to Reduce Part Variation in a Stamping Plant", *1997 Society of Automotive Engineers International Congress & Exposition*, Detroit, MI.
113. Cao, J. and Boyce, M., "Design and Control of Forming Parameters Using Finite Element Analysis", *Symposium on Computational Material Modeling*, American Society of Mechanical Engineers, Chicago, IL. 1994, pp.265.
114. Sunseri, M., Karafillis, A., Cao, J. and Boyce, M., "Methods to Obtain the Net Shape in Aluminum Sheet Forming Using Active Binder Force Control", *Symposium on Mechanics of Materials Processing and Manufacturing*, 1994. ASME, Chicago, IL.
115. Cao, J., Bakkestuen, R., Jalkh, P., Boyce, M. and Hardt, D., "Improvement of Forming Height and Stability of Aluminum Parts Using Active Binder Control", *International Deep Drawing Conference*, 1994, Lisboa, Portugal.

NON-REFEREED CONFERENCE PUBLICATIONS

116. Cao, J. Malhotra, R., Beltran, M.J, Reddy, N.V. (2011) "Incremental Forming at Multi-Scales", *Proceedings of 2011 NSF Engineering Research and Innovation Conference*, Atlanta, Georgia, Jan. 4-7, 2011.
117. Magargee, J., McHugh, M. Cao, J. and Brink, D.D. (2011) "Evaluating the Tensile and Compressive Behavior of Thin Metal Sheets Using a Transparent Micro-Wedge Device", *Proceedings of 2011 NSF Engineering Research and Innovation Conference*, Atlanta, Georgia, Jan. 4-7, 2011.
118. Cao, J., Dohda, K., Zhou, R., Makino, T. and Futamura, M. (2010) "An Investigation on Bump Formation in Forming of Micro Dimples", *Metal Forming 2010*, Toyohashi, Japan, September 19-22, 2010, pp.1160-1164.
119. Cao, J and Malhotra, R. (2009) "Incremental Forming at Multi-Scales", *Proceedings of 2009 NSF Engineering Research and Innovation Conference*, Honolulu, Hawaii, June 22-25, 2009.
120. Cao, J., Peshkin, M., Mahayotsanun, N., Gao, R.X., Sah, S. and Wang, Chuan-tao (2009) "Tooling-Integrated Draw-In and Pressure Sensing for Stamping Process Monitoring", *Proceedings of 2009 NSF Engineering Research and Innovation Conference*, Honolulu, Hawaii, June 22-25, 2009.
121. Smith, S., Woody, B., Cao, J., Belytschko, T., Malhotra, R., Huang, Y., Ziegert, J., Gnäupel-Herold, T. and Foecke, T. (2009) "Deformation Machining – A New Hybrid Process", *Proceedings of 2009 NSF Engineering Research and Innovation Conference*, Honolulu, Hawaii, June 22-25, 2009.
122. Huang, Y., Beltran, M. and Cao, J. (2008) "Experimental and Numerical Investigation of Forming Limits in Single Point Incremental Forming of a V-Shape Groove", *Proceedings of the 8th International Conference on Frontiers of Design and Manufacturing*, September 23~26, 2008, Tianjin, China.

123. Cao, J., Lee, W., Huang, Y., Wang, H-P (2008) "Numerical and experimental Analysis of Subtle Surface Distortion in Sheet Metal Forming", in The 8th World Congress on Computational Mechanics/The 5th European Congress on Computational Methods in Applied Sciences and Engineering, edited by B.A. Schrefler and U. Perego, Proceedings of WCCM8 and ECCOMAS2008, in Venice, Italy, Jun. 30-Jul. 4, International Center for Numerical Methods in Engineering (CIMNE), Barcelona, Spain, 2008 pp. 228.
124. Cao, J., Lee, W. and Padvoiskis, J. (2008) "Characterization of Material Deformation Behavior of Woven Composites", in 2008 NSF Engineering Research and Innovation Conference in Knoxville, Tennessee, U.S.A., Jan. 7-10, 2008.
125. Cao, J., Peshkin, M. and Mahayotsanun, N., Gao, R.X., Sah, S. and Wang, C.T. (2008) "Integrated Sensing for Stamping Process Monitoring and Control", in 2008 NSF Engineering Research and Innovation Conference in Knoxville, Tennessee, U.S.A., Jan. 7-10, 2008.
126. Kinsey, B.L., Onyancha, R.M., Parasiz, S.A., Krishnan, N., Cao, J., Ehmann, K., Liu, W.K., Espinosa, H. and Li, M. (2008) "Microforming Processes – Fundamental Studies and Developments", in 2008 NSF Engineering Research and Innovation Conference in Knoxville, Tennessee, U.S.A., Jan. 7-10, 2008.
127. Lee, W. and Cao, J. (2007) "Characterization of Woven Composites Forming from Macro to Micro", International Conference on Intelligent Textiles 2007 in Seoul National University, Seoul, South Korea, Nov. 11-13, 2007.
128. Lee, W. and Cao, J. (2007) "Non-orthogonal constitutive law with considering the tensile effect on the shear modulus", 2007 NSF Grantee Conference on International Research and Education in Engineering in Purdue University, Indiana, U.S.A., Oct.30-Nov.1, 2007.
129. Sherwood, J. A. and Cao, J. (2006) "Collaborative Research: Enhancing the Understanding of the Fundamental Mechanisms of Thermostamping Woven Composites to Develop a Comprehensive Design Tool", *National Science Foundation DMII Grantee Conference*, St. Louis, MO.
130. Cao, J. and Krishnan, N. (2006) "Experimental Study of Friction Behavior in Micropin Extrusion", *International Conference of Frontiers in Design and Manufacturing*, Guangzhou, China.
131. Cao, J. and Krishnan, N. (2005) "Recent Advances in Microforming: Science, Technology and Applications", *TMS*, Pittsburg, PA.
132. Buranathiti, T. and Cao, J. (2005) "Benchmark Simulation Results: Automotive Deck Lid Inner Panel (Benchmark 1)", *NumiSheet 2005*, Detroit, MI.
133. Buranathiti, T. and Cao, J. (2005) "Numisheet 2005 Benchmark Analysis on Forming of an Automotive Deck Lid Inner Panel (Benchmark 1)", *NumiSheet 2005*, Detroit, MI.
134. Buranathiti, T. and Cao, J. (2005) "Benchmark Simulation Results: Automotive Underbody Cross Member (Benchmark 2)", *NumiSheet 2005*, Detroit, MI.
135. Buranathiti, T. and Cao, J. (2005) "Numisheet 2005 Benchmark Analysis on Forming of an Automotive Underbody Cross Member (Benchmark 2)", *NumiSheet 2005*, Detroit, MI.
136. Buranathiti, T. and Cao, J. (2005) "Benchmark Simulation Results: Channel Draw/Cylindrical Cup 2-Stage Test (Benchmark 3)", *NumiSheet 2005*, Detroit, MI.
137. Liu, W.K., Cao, J. Cheng, H.S., Lu, H. (2004) "Founding of New Numerical Tool (RKEM) and Advancement of Experimental Setup", *2004 National Science Foundation DMII Grantee Conference*, January, Dallas, TX.
138. Jian Cao, Wing Kam Liu, Hang Shawn Cheng, Hongsheng Lu (2003) "A Multi-Scale Approach for Predicting Wrinkling and its Experimental Verification ", *2003 National Science Foundation DMII Grantee Conference*, Birmingham, Alabama.

139. Jian Cao, Julie Chen, Samuel Chow, Darin Lussier, Xiongqi Peng, Xue Pu (2003), "Characterization in Stamping of Woven Composites", *2003 National Science Foundation DMIII Grantee Conference*, Birmingham, Alabama.
140. Cao, J. (2002) "Springback Prediction in Straight Flanging", *2002 Plasticity Conference*, Aruba, Netherland.
141. Cao, J. and Wang, X. (2001) "Experimental Study on Sheet Wrinkling Behavior and its Analysis", *2001 National Science Foundation DMII Grantee Conference*, Florida.
142. Cao, J., Kinsey, B.L., and Song, N. (2001) "Experimental Implementation of the Novel Forming Process", *2001 National Science Foundation DMII Grantee Conference*, Florida.
143. Chen, J., Bulusu, A., Cao, J. and Peng, X. (2001) "Intelligent Material and Process Design for Stamping of Structural Composites: Modeling and Comparisons", *2001 National Science Foundation DMII Grantee Conference*, Gainesville, Florida.
144. Cao, J. and Wang, X. (2000) "A Stress Based Wrinkling Criterion", *2000 National Science Foundation DMII Grantee Conference*, Vancouver, Canada.
145. Cao, J., Kinsey, B.L., and Song, N. (2000) "Enhance the Formability of Sheet Metal via Smart Tooling", *2000 National Science Foundation DMII Grantee Conference*, Vancouver, Canada.
146. Chen, J., Bulusu, A., Cao, J. and Peng, X. (2000) "Intelligent Material and Process Design for Stamping of Structural Composites: Fabric Modeling", *2000 National Science Foundation DMII Grantee Conference*, Vancouver, Canada.
147. Peng, X.Q. and Cao, J. (1999) "Material Characterization in Forming Structural Composites", *ME100, Polytechnic University, NY*.
148. Chen J., Sherwood, J, and Cao, J. (1999) "High Volume Manufacturing of Structural Composites", *Tsai Symposium on Composites for the Next Millennium*, July 2-3, 1999, Tours, France.

ADDITIONAL CONFERENCE/WORKSHOP PRESENTATIONS

Referred and non-referred conference papers were presented at the corresponding conferences either by Jian Cao or by her students. In addition to those presentations, the following presentations were made by Jian Cao:

149. Predictive Science Based Design for Advanced Metal Forming, January 25, 2013, STC-F, CIRP January meeting, Paris.
150. Combined Isotropic-kinematic Hardening Behaviour in Sheet Metal Forming Processes & Failure in Incremental Forming, August 24, 2012, General Assembly, Part II.
151. Numerical Simulation of Incremental Forming, 2010, CIRP January meeting, Paris.
152. Effect of Surface Texture on Algae Growth, 2009, CIRP General Assembly Part II, Boston.
153. A New Experimental Apparatus for Measuring the Kinematic Hardening Behavior in Sheet Metals, 2007, CIRP January Meeting.
154. Draw-in Sensor for Real-time Measurement/Control in Sheet Metal Forming, 2006, *North American Deep Drawing Group Research Conference*.
155. CAREER Program Development, 2005, *TMS*.
156. Manufacturing Processes Research on Metals, 2004, *Interagency Meeting on Metal Research*.
157. The US National Science Foundation's Investment in Manufacturing, 2004, *China Natural Science Foundation*.
158. Intelligent Manufacturing and Maintenance System, 2004, *Manufacturing Frontier Conference*.
159. From the Nano Tech Lab to the Manufacturing Industry: The NSF Initiative, 2004, *Indo-US Advanced Manufacturing Forum*.

160. Opportunities and Challenges in Micro-forming, 2004, *Indo-US Advanced Manufacturing Forum*.
161. Current Funded Projects & Future Directions in Manufacturing Processes Research, 2003, *Interagency Meeting on Metal Research*.
162. Life Beyond the Ph.D., 2003, *National Science Foundation Division of Design, Manufacturing and Industrial Innovation Grantee Conference*.
163. Research Opportunities in Green Engineering: Bridging Design and Manufacturing, 2003, *Society of Women Engineers Conference*.
164. Engineering Applications of Newly Proposed Reproducing Kernel Element Method, 2003, *International Congress of Applied Mathematics*.
165. A Multi-Scale Meshfree Approach for Predicting Wrinkling and Experimental Verification, 2003, *US Congress of Computational Mechanics*.
166. Process Control: Hardware and Software, 2002, *North American Deep Drawing Group Research Conference*.
167. Instability Analysis – Wrinkling, 2001, *North American Deep Drawing Group Research Conference*.
168. Wrinkling Prediction in Numerical Simulations, 1999, *US Congress of Computational Mechanics*.
169. Springback in Flanging Operation, 1999, *North American Deep Drawing Group Research Conference*.

INVITED PRESENTATIONS

1. Plenary Keynote, Dieless Rapid Forming, 12th International Conference on Technology of Plasticity, September 17-22, 2017, Cambridge, U.K.
2. Invited Speaker, Digital Manufacturing – what is it and how will it impact our world? NU Knowledge at Noon, April 5, 2016, Evanston, IL.
3. Invited Speaker, Advanced Manufacturing – Current Challenge in Computing Conference, March 29 – 31, 2016, Napa, CA.
4. Invited Speaker, Generis American Manufacturing Summit, February 29 – March 1, 2016, Chicago, Illinois, <http://manufacturing.generisgp.com/summit/speakers>
5. Invited Talk, Integration of Innovative Manufacturing Processes, Mechanics and Materials Design for Energy-efficient Distributed Manufacturing, December 15, 2015, University of Michigan, Ann Arbor.
6. Keynote, Digital Manufacturing, 12th Conference on Advanced Molding and Materials Processing, November 20, 2015, Nansha, China
7. Keynote, Cope with Uncertainties in Sheet Metal Forming Processes – Classification and Methodologies, 2nd Int. Conf on Uncertainty in Mechanical Engineering, Nov. 19, 2015, Darmstadt, Germany.
8. Keynote, Advances in Modeling of Manufacturing Process, Society of Engineering Science Annual Technical Conference, Oct. 28 – 30, 2015, College Station, TX.
9. Invited Talk, Additive Manufacturing, NAS workshop, Oct. 7-9, 2015, Washington, D.C.
10. Invited Talk, “Digital Manufacturing for Flexibility and Energy Efficiency”, DMDII Summer Institute on Sustainability and Energy, August 10, 2015, Chicago, IL.
11. Invited Talk, “Coupling Manufacturing, Mechanics and Materials Design in Additive Manufacturing”, NSF Workshop on Multiscale/3D Printing Cement, July 16-17, Nashville, TN.
12. Plenary Talk, “Flexible Energy Efficient Sheet Metal Forming”, International Deep Drawing Research Group 2015 Conference, Shanghai, China, June 1, 2015.
13. Invited Panelist, Advanced Manufacturing Workshop, University of Pennsylvania, May 21, 2015.

14. Department Seminar Speaker, Mechanical & Industrial Engineering, University of Iowa, May 7, 2015.
15. Invited Talk, "Opportunities and Challenges in Rapid Flexible Manufacturing", U.S. National Committee for Theoretical and Applied Mechanics, The National Academies, May 1, 2015.
16. Invited Seminar, "Challenges and Opportunities in Linking Materials, Processes and Performance", NIST, April 30, 2015.
17. Invited Speaker, Generis American Manufacturing Summit, March 10-11, 2015, Chicago, Illinois, <http://manufacturing.generisgp.com/summit/speakers>.
18. Panelist, "Reaping the Benefits of Corporate Sponsored Research: A Panel Discussion by McCormick Faculty", Northwestern University, Jan. 22, 2015.
19. Invited Lecturer "Flexible Energy-Efficient Manufacturing", Hong Kong Productivity Council, Oct. 13, 2014.
20. Plenary Talk, "Rapid Manufacturing Processes for Enhancing Energy Efficiency", International Conference on Advanced Aerospace Manufacturing, May 22-23, 2014, Shanghai, China.
21. Invited Department Seminar, Materials Science and Engineering, Carnegie Mellon, April 25, 2014.
22. Curie Lecture, University of Florida, Gainesville, February 18, 2014.
23. Plenary Talk "Microforming", 2013 International Conference on Multi-Material Micro-Manufacture (4M2013), 8-10 October 2013, San Sebastian, Spain.
24. Keynote Talk, "Metal forming proc16th International Conference on Advances in Materials & Processing Technologies (AMPT 2013), Sept. 22 – 26, 2013, Taiwan.
25. Invited Talk "Eletroplasticity – Yes or No", University of Ulsan, May 4, 2013, Ulsan, South Korea
26. Invited Talk "Manufacturing Aspects in Systems Engineering for Clean and Renewable Energy Manufacturing", National Science Foundation, March 14, 2013, Arlington, VA.
27. Invited Talk "Converging Knowledge and Technologies for Societal Benefit - Implications: Societal collective outcomes, including manufacturing", National Science Foundation, December 11, 2012, Arlington, VA.
28. Invited Seminar, "Material Design and Manufacturing", Schlumberger, November 12, 2012, Houston, TX.
29. Keynote Talk "Small Features for Large Saving", ISGMA 2012 International Symposium on Green Manufacturing and Applications, August 25-27, 2012, Jeju, Korea.
30. Invited Talk "Transforming the Landscape of Manufacturing", WTEC Study on NBIC2, National Science Foundation, June 25, 2012.
31. Invited Seminar "Point-of-Need Manufacturing Processes for Enhancing Energy Efficiency", University of Texas, Austin, April 10, 2012.
32. Invited Seminar "Point-of-Need Manufacturing Processes for Enhancing Energy Efficiency", Texas A&M, College Station, Texas, April 11, 2012.
33. Invited Epstein Institute Seminar, "Point-of-Need Manufacturing Processes for Enhancing Energy Efficiency", Department of Daniel J. Epstein Department of Industrial and System Engineering, University of Southern California, October 25, 2011.
34. Keynote Talk, "Engineering Energy-efficient Surfaces and Forming Processes", ISGMA 2011 International Symposium on Green Manufacturing and Applications, October 6-7, 2011, Seoul, Korea.
35. Invited Talk, "Recent Findings in Incremental Forming", Institute of Forming Technology and Lightweight Construction (IUL), Dortmund, Germany, August, 2011.
36. Invited Talk, "Surface Texturing: Theory, Fabrication Methods and Applications", Institute of Forming Technology and Lightweight Construction (IUL), Dortmund, Germany, August, 2011.
37. Invited Talk, "Manufacturing Processes to Increase Energy Efficiency and Energy Independency", March 15, 2011, Kansas State University.

38. Invited Talk, "Incremental forming at multi-scales", Indo-US forum, Aurangabad, India, Dec. 17, 2010.
39. Keynote Talk, "Recent findings in microforming and its applications", The 10th Asia-Pacific Conference on Engineering Plasticity and Its Applications, Wuhan, China, Nov. 15-17, 2010
40. Keynote Talk, "Micromanufacturing in Biomedical and Energy Applications", International Forum on MicroManufacturing, Gifu, Japan, Oct. 21-23, 2010.
41. Keynote Talk, "An investigation on bump formation in forming of micro dimples", Metal Forming 2010, Toyohashi, Japan, September 19-22, 2010.
42. Plenary Talk, "Manufacturing Processes to Increase Energy Efficiency and Energy Independency", 9th International Conference on Frontiers of Design and Manufacturing, Changsha, China, July 17-20, 2010.
43. Association for Manufacturing Technology, "New Technology Developments in Japan", 2010 Manufacturing Technology Forum, March 31, 2010, Nashville, TN.
44. NSF US-Egypt Wind Energy Workshop, "Understanding the Life of Power Transmission Elements of Wind Turbine Systems", March 22-24, 2010, Cairo, Egypt.
45. Silgan, "Sheet Metal Forming Research at AMPL", February 25, 2010, Wisconsin.
46. Naval Research Laboratory, "Material Formability and Geometry Flexibility in the Deformation Processes," January 28, 2010.
47. India Institute of Technology, Kanpur, "Forming Processes and Surface Texturing in the Era of Energy Research", December 10, 2009.
48. Argonne National Laboratory, Argonne, IL, "Surface Texturing in the Era of Energy Research", November 18, 2009.
49. Shanghai Jiao Tong University, China, "Surface Texturing and Manufacturing Processes to Increase Energy Efficiency", September 14 and September 15, 2009.
50. National Taiwan University, Taiwan, "Surface Texturing and Manufacturing Processes to Increase Energy Efficiency" & "Research at ME of Northwestern University", July 13, 2009.
51. Chung Yuan Christian University, Taiwan, "Surface Texturing and Manufacturing Processes to Increase Energy Efficiency", July 13, 2009.
52. NSF Energy Workshop, "Better efficiency by surface texturing", June 21, 2009.
53. University of Minnesota, Twin City, "Surface Texturing and Manufacturing Processes to Increase Energy Efficiency", April 1, 2009.
54. Society of Manufacturing Engineers Micromanufacturing Conference, "Microforming", March 31, 2009.
55. University of Colorado, Boulder, "Material and Friction Characterization in Forming", February 26, 2009.
56. University of Connecticut, "Material and Friction Characterization in Forming", January 23, 2009.
57. India Institute of Technology, Kanpur, "Metal Forming: Process Innovation and Mechanics", December 15, 2008.
58. Georgia Institute of Technology, "Material and Friction Characterization in Forming", Oct. 24, 2008.
59. Shanghai Jiao Tong University, "Material and Friction Characterization in Forming", Sept. 22, 2008.
60. Seoul National University, Department of Materials Science and Engineering, "Incremental Forming: Advances and Challenges", Sept. 12, 2008.
61. Keynote Presentation, "Incremental Forming: Advances and Challenges", International Conference on Technology of Plasticity, Gyeongju Korea, Sept. 11, 2008.
62. General Electric, "Surface Engineering and its Effect on Friction Control", July 22, 2008.
63. Society of Manufacturing Engineers Micromanufacturing Conference, "Microforming", April 21, 2008.

64. General Motors, "Integrated Sensing System for Stamping Monitoring and Control", April 18, 2008.
65. University of North Carolina, Charlotte, "Mechanics and Control of Deformation Processes", March 18, 2008.
66. University of California, Irvine, "Micromanufacturing and Microfluidics Research at Northwestern", with W.K. Liu, Feb. 28, 2008.
67. California State University, Fullerton, "Introduction of Research at the Department of Mechanical Engineering at Northwestern University", Feb. 27, 2008.
68. 2008 NSF Engineering Research and Innovation Conference in Knoxville, Tennessee, U.S.A. "An American Manufacturing Innovation Initiative", Jan. 10, 2008.
69. 14th International Symposium on Plasticity and its Current Applications in Kailua-Kona, Hawaii, U.S.A, "Experimental and Numerical Investigation of Combined Isotropic-kinematic Hardening Behavior", Jan. 4, 2008.
70. International Symposium on Automotive Sheet Metal Forming, India, Dec. 17, 2007, "Predictability of Numerical Simulations".
71. Keynote, International Conference on Future Trends in Composite Materials and Processing, India, Dec. 14, 2007, "Material Characterization of Woven Composites".
72. Keynote, International Conference on Intelligent Textiles, Seoul, South Korea, Nov. 12, 2007, "Material Characterization of Woven Composites".
73. INSA-Lyon (Institut National des Sciences Appliquées de Lyon), France, Sept. 20, 2007, "Size Effects in Woven Composites and Metals".
74. Ford Motor Company, Dearborn, Michigan, September 7, 2007, "Enhancing Interface Performance through Surface Texturing".
75. Workshop on Advanced Technologies for New Materials, Taiwan, July 16, 2007, « Develop Computer-Integrated Systems for Composite Sheet Forming Processes From Micro to Macro Scale".
76. SME Micromanufacturing Conference (short course), March 13, 2007, "Fundamentals and Challenges in Microforming".
77. University of Stuttgart, Institute of Metal Forming, Germany, Oct. 5, 2006, "Mechanics and Control of Sheet Metal Forming Processes in Automotive Applications".
78. General Motors, September 29, 2006, "An Investigation of Surface Distortion in Line Dies".
79. University of Michigan, Ann Arbor, September 28, 2006, "Manufacturing at Multi-scales".
80. Tokyo University of Agriculture and Technology, Japan, July 14, 2006, "Mechanics and Control of Sheet Metal Forming Processes".
81. Nagoya Institute of Technology, Japan, July 7, 2006, "Fundamentals and Challenges in Microforming".
82. Toyota, July 7, 2006, "Characterization of Wrinkling and Draw-in in Sheet Metal Forming".
83. Chung Yuan Christian University, Taiwan, July 5, 2006, "Fundamentals and Challenges in Microforming".
84. Shanghai JiaoTong University, China, June 28, 2006, "Advances in Metal Forming".
85. Boeing Phantom Works, St Louis, Missouri, June 13, 2006, "Manufacturing at Multi-scales".
86. General Motors, Michigan, April 3, 2006, "Prediction of Surface Distortion".
87. Univ. of Massachusetts, Lowell, April 21, 2006, "Career Program Development".
88. The Chinese University of Hong Kong, Hong Kong, January 18, 2006, "Manufacturing at Multi-scales".
89. HuaZhong University of Science and Technology, China, January 16, 2006, "Mechanics and Control of Sheet Metal Forming Processes".
90. Hong Kong University of Science and Technology, January 13 2006, "Material Characterization of Woven Composites".
91. Purdue University, December 15, 2005, "Manufacturing at Multi-scales".
92. M.I.T., November 29, 2005, "Manufacturing at Multi-scales".

93. Unico, Inc., Wisconsin, November 22, 2005, "Real-time Calculation of Optimal Blank Holder Force History in Sheet Metal Forming".
94. IMECE Panel on Biomanufacturing, November 10, 2005, "Micromanufacturing".
95. General Motors, Michigan, October 27, 2005, "Characterization of Draw-in and Wrinkling in Sheet Metal Forming".
96. Shanghai JiaoTong University, China, Oct. 11, 2005, "Innovative Processes for Sustainable Manufacturing".
97. Plenary Talk: M&P 2005, Seattle, WA, June 21, 2005, "Manufacturing at Multi-scales".
98. Drexel University, September 23, 2005, "Manufacturing at Multi-scales".
99. Clemson University, August 30, 2005, "Mechanics and Control of Sheet Metal Forming Processes in Automotive Applications".
100. Georgia Tech Institute of Technology, Oct. 29, 2004, "Microforming: Study of Grain Size and Friction Effects in the Extrusions of Micropins".
101. Purdue University, Oct. 12, 2004, "Current Activities and Future Directions in Manufacturing Processes Research".
102. Hong Kong University of Science and Technology, December 9, 2003, "Fundamentals of Forming at Multiple Scales".
103. Ohio State University, November 13, 2003, "Understanding the Material Processing & Manufacturing Program".
104. National Science Foundation, May 27, 2003, "Sheet Forming and Looking Beyond".
105. New Jersey Institute of Technology, November 13, 2002, "Modeling Tools and Forming Technologies for the Enhancement of Design Attributes".
106. Michigan Technological University, November 1, 2001, "Modeling Tools and Forming Technologies for the Enhancement of Design Attributes".
107. University of Leuven, Belgium, April 23, 2001, "The Relationship between Materials Characterization Methods and Material Models for Stamping of Woven Fabric/Thermoplastic Composites".
108. MSC, Inc., Illinois, December 17, 2000, "Analysis of the Softcoil Problem".
109. Illinois Institute of Technology, November 29, 2000, "Material Characterization in Forming Structure Composites".
110. Rensselaer Polytechnic Institute, September 22, 2000, "Material Characterization in Forming Structure Composites".
111. General Electric, September 21, 2000, "Material Characterization in Forming Structure Composites".
112. University of Nevada, Reno, September 14, 2000, "Material characterization and instability analysis in sheet materials forming".
113. Ford Scientific Research Lab, September 6, 2000, "Material Characterization in Forming Structure Composites".
114. National Steel Inc., September 8, 2000, "Material Characterization and Instability Analysis in Sheet Materials Forming".
115. Columbia University, July 6, 2000, "A Computer Integrated System for Sheet Forming".
116. Northeastern University, May 12, 2000, "Modeling Tools and Forming Technologies for the Enhancement of Design Attributes".
117. University of Illinois, Chicago, February 17, 2000, "A Computer Integrated System for Sheet Forming".
118. General Motors, January 28, 2000, "Stamping Technologies to Reduce Weight and Lead Time".
119. University of Washington, January 7, 2000, "A Computer Integrated System for Sheet Forming".
120. Northwestern Polytechnical University, December, 1999, "Material Characterization in Forming Structure Composites".

121. Georgia Institute of Technology, September 7, 1999, "A Computer Integrated System for Sheet Forming".
122. University of Maryland, College Park, July 21, 1999, "A Computer Integrated System for Sheet Forming".
123. Women in Engineering, University of Maryland, July 23, 1999.
124. Keynote, 'Plasticity in Manufacturing Processes & Product Performance' at 13th U. S. National Congress of Applied Mechanics, Gainesville, Florida, 21-26 June 1998.
125. University of Massachusetts, Lowell, September 15, 1998, "A Computer Integrated System for Sheet Forming".

PROFESSIONAL ACTIVITIES

Committee Memberships

- Member, Scientific Advisory Board, Digital Manufacturing and Design (DManD) Centre, Singapore University of Technology and Design, July 2016 – present.
- Member, Board of Directors, mHub, Chicago, May 2016 – present.
- External Review Board, NSF Consortium for Innovation in Manufacturing and Materials, Louisiana, Oct. 2015 to September 2020.
- Member, Technical Advisory Board, Digital Manufacturing and Design Innovation Institute, 2014 - present.
- Member, Advisory Committee, Department of Mechanical Engineering, University of California, Berkeley, 2014 – 2017
- External Academic Advisor, Department of Mechanical and Biomedical Engineering, City University of Hong Kong, 2014 – 2017.
- Member, Scientific Committee, Surface Integrity (3rd CIRP CSI), Charlotte, NC, June 8-10, 2016.
- Vice-Chair, STC-Forming, The International Academy for Production Engineering (CIRP), January 2014 – December 2016.
- Member, Chicago Metro Metals Consortium (CMMC) Research and Innovation Subcommittee, 2014 - present
- Member, SME International Director and Member Council Nominating Committee, 2013 - 2014
- Panelist, World Technology Evaluation Study on System Engineering for Renewable Energy, December 2012 – October 2013
- Panelist, World Technology Evaluation Study on Transforming Tools of Emerging and Converging Technologies for Societal Benefit (beyond Nano-Bio-Info-Cognitive Technologies, NBIC2) <http://www.wtec.org/NBIC2/index.html>, June 2012 – June 2013.
- Chair, M. Eugene Merchant Medal Committee of ASME/SME, July 2012 – June 2015.
- Chair, SME/NAMRI Honors Committee, June 2012 – June 2013.
- President, SME/North America Manufacturing Research Institution, June 2011 – June 2012.
- Secretary, STC-Forming, The International Academy for Production Engineering (CIRP), January 2011 – December 2013.
- President-elect, SME/North America Manufacturing Research Institution, May 2010 – May 2011.
- Member, Johnson & Johnson Consumer Companies, Inc. Medal Committee, July 2010 – June 2013.
- Chair, Administration and Finance Committee, ASME Technical Communities, July 2009 – June 2012.
- Vice Chair, Manufacturing Group, ASME, July 2009 – June 2010.
- Member, M. Eugene Merchant Medal Committee of ASME/SME, July 2007 – June 2012.
- Secretary, SME/North America Manufacturing Research Institution, May 2009 – May 2010.
- Board Member, SME/North America Manufacturing Research Institution, May 2004 – May 2011.

Chair, Conference Planning Committee, ASME/MED & SME/NAMRI & JMSE, 2009 - 2011

Executive Committee, ASME Manufacturing Engineering Division, July 2004– June 2009.

| | |
|-----------------|-----------------------|
| Incoming Member | July 2004 – June 2005 |
| Secretary | July 2005 – June 2006 |
| Program Chair | July 2006 – June 2007 |
| Vice Chair | July 2007 – June 2008 |
| Chair | July 2008 – June 2009 |

Member, ASME Manufacturing Technology Group Operating Boards, July 2008 – June 2009.

Member, Scientific Committee, ESAFORM (European Scientific Association for material FORMing), April 2006 – present. (2006 was the first year that ESAFORM invited researchers outside of Europe to be on the Scientific Committee)

Member, Scientific Committee, International Conference on Technology of Plasticity, September 2008.

Member, Scientific Committee, NUMIFORM'07, June 2007.

Member, Organization Committee, 2nd International Conference on Micromanufacturing, Clemson, SC, 2007.

Member, Organization Committee, 1st International Conference on Micromanufacturing, Urbana, IL, 2006.

Member, Program Committee, International Conference on Frontiers of Design and Manufacturing, 2006.

Member, Scientific Committee, NAMRC, 2005 – present.

Member, Executive Committee, North American Deep Drawing Research Group, March 2003 – June 2006.

Member, Technical Committee, 8th International Conference on Numerical Methods of Industrial Forming Processes, NUMIFORM'2004, Columbus, Ohio.

Member, Technical Committee, NUMISHEET'2005, Detroit, Michigan.

Member, USA program committee, 2004 Japan-USA Symposium on Flexible Automation, Denver, U.S.A.

Chair, Program Committee of ASME Manufacturing Engineering Division, May 2001 – Nov. 2002

Chair, Committee on Integration of Computational Mechanics and Manufacturing (ICMM), US Association for Computational Mechanics, December 1999 – 2000

Chair, Committee on Materials Processing and Manufacturing, Applied Mechanics Division, ASME, Nov. 2001 – Nov. 2003.

Member, USA program committee, 2002 Japan-USA Symposium on Flexible Automation, Hiroshima, Japan.

Member, International executive committee, the 10th JSME/ASME Materials and Processing Conference, U.S.A., Oct. 15-18, 2002.

Vice-Chair, Committee on Materials Processing and Manufacturing, Applied Mechanics Division, ASME, Nov. 1999 – Nov. 2001.

Scientific Committee Member, WSES International Conference on Mathematics and Computers in Mechanical Engineering, Marathon, Florida Keys, Florida, July 25-29, 1999

Liaison Officer, Manufacturing Engineering Division of ASME, Nov. 1998 – May 2001.

Organizers

Organizer, 3rd CIRP Biomanufacturing Conference, July 12-14, 2016, Chicago, Illinois.

Organizer, North America Deep Drawing Research Group Annual Meeting, May 5, 2015, Evanston, Illinois.

Organizer, Workshop on Future Research Needs in Advanced Manufacturing from Industrial Perspective, sponsored by NSF, August 11-13, 2013, Arlington, Virginia.

Program co-Chair, 1st CIRP BioManufacturing Conference, March 2013, Tokyo, Japan.

Conference co-Chair, 2012 International Conference on MicroManufacturing, March 2012, Evanston, IL.

Program co-Chair, 2010 ASME/JSME International Flexible Automation, Tokyo, Japan, 2009 – 2010.

Program co-Chair, ASME Nanoengineering for Medicine and Biology, Feb. 2010.

Conference Chair, ASME International Conference of Manufacturing Science and Engineering & JSME Materials & Processing, Evanston, IL, Oct. 2008.

Conference co-Chair, 6th International Workshop on Microfactories, Evanston, IL, Oct. 2008.

Co-organizer, Mini-symposium on Composites, ESAFORM 2008, Lyon, France, April 2008.

Organizer, Panel on Coping with the CAREER Award, National Science Foundation DMII Grantee Conference, TN, January 2008.

Co-organizer, CAREER Proposal Writing Workshop, sponsored by NSF, March 23-26, 2007.

Co-organizer, Workshop on Advanced High-Strength Steels, co-sponsored by NSF, DoE and ASP, October 22-23, 2006.

Co-organizer, Mini-symposium on Composites, ESAFORM 2007, Spain, April 2007.

Co-organizer, CAREER Proposal Writing Workshop, sponsored by National Science Foundation, April 6, 2006.

Co-organizer, Mini-symposium on Composites, ESAFORM 2006, April 2006.

Co-organizer, CAREER Proposal Writing Workshop, sponsored by National Science Foundation, May 24, 2005.

Co-organizer, Mini-symposium on Composites, ESAFORM 2005, April 2005.

Co-organizer, CAREER Proposal Writing Workshop, sponsored by National Science Foundation, Nov. 13, 2004.

Organizer, Symposium on Computational Methods in Sheet Forming, *Sixth World Congress on Computational Mechanics*, Beijing, China, September 5-10, 2004

Chair, Benchmark Analysis Summary Committee, *NUMISHEET2005*, Detroit, September, 2005.

Organizer, Benchmark Analysis on Composite Sheet Forming, 2002 – present.

Organizer, Symposium on Materials Development and Utilization in Forming, *International Mechanical Engineering Congress and Exposition*, New York, New York, November, 2001.

Organizer, National Science Foundation Workshop on Composite Sheet Forming, Lowell, Massachusetts, September, 2001.

Organizer, CAREER Workshop at *the 2001 National Science Foundation Design and Manufacturing Research Conference*, Tampa, Florida, January, 2001.

Organizer, Symposium on Advances in Metal Forming, *International Mechanical Engineering Congress and Exposition*, Orlando, Florida, November, 2000

Co-Organizer, Session "Affordable Composites Manufacturing: New Advances in Forming, Stamping, and other rapid processing methods", at the *15th Annual Technical Conference of the American Society for Composites (ASC)*, Texas, September, 2000.

Organizer, CAREER Workshop at *the 2000 National Science Foundation Design and Manufacturing Research Conference*, Vancouver, British Columbia, Canada, January, 2000.

Co-Organizer, Session 'Engineering Mechanics in Manufacturing Processes and Material Processing', ASME summer conference, McNu'97, Evanston, Illinois, July 1997.

NU Service

Member, Faculty Hiring Search Committee, Physics and Astronomy, 2016.
 Member, Program Review of School of Education and Social Policy, 2016.
 Member, Faculty Hiring Search Committee, Mechanical Engineering, 2016.
 Member, Search Committee for Senior Vice President for Business and Finance, Feb. – June 2014.
 Associate Vice President for Research, October 2012 - present
 Member, Advisory Council for the Office of Fellowships, September 2013 - present
 Member, Tenure and Promotion Committee, McCormick, Northwestern University, Sept. 2011 – August 2013.
 Member, The Limited Submissions Advisory Committee, Northwestern University, Sept. 2009 – August 2010.
 Member, Faculty Search Committee, Sept. 2009 – Feb. 2010.
 Chair, ME Graduate Studies, Mechanical Engineering, Sept. 2007 – Sept. 2012
 Member, General Faculty Committee, Northwestern University, Sept. 2008 – August 2011
 Member, ME Machine Shop Oversight Committee, Sept. 2008 – August 2009
 Member, Faculty Search Committee, Mechanical Engineering, Oct. 2007 – May 2008
 Interim Associate Chair, Mechanical Engineering, Sept. 2006 – August 2007
 Speaker, NSF Graduate Fellowships Meeting, Oct. 2, 2007
 Speaker, Navigating the Professoriate Program: Grantsmanship and Identifying Funding Opportunities, April 5, 2007.
 Member, Energy Committee, Mechanical Engineering, Jan. 2006 – June 2006.
 Organizer, Mechanics Colloquia Seminar Series, 2001 – Sept. 2003.
 Editor, Newsletter of Department of Mechanical Engineering, 1998 – Sept. 2003
 Member, Faculty Search Committee, Industrial Engineering, Oct. 2002 – June 2003.
 Member, Faculty Search Committee, Mechanical Engineering, Sept. 2001 – Sept. 2002
 Member, Committee on Classrooms of the Searle Center for Teaching Excellence, January - June, 2000.
 Member, Faculty Search Committee, Mechanical Engineering, August 1999 – January 2000.
 Creator, ME Design and Manufacturing Group Web Site, 1998.
 Member, College Curriculum Committee, Northwestern University, Fall 1997.

National Science Foundation (NSF) Service

Panelist, the World Technology Evaluation Study on Advanced Manufacturing, www.wtec.org/advmfg, sponsored by NSF.
 Initiated the World Technology Evaluation Study on Micro-manufacturing, www.wtec.org/micromfg, Dec. 2003 – September 2005, co-sponsored by NSF, ONR, DOE and NIST.
 Co-initiated joint proposal review and co-funding for proposals in the area of predictive polymer processing between NSF/DMII and DOE, 2005.
 Co-initiated joint proposal review and co-funding for proposals in the area of coating and deposition between NSF/DMII and NSF/CMS, 2004 – 2005.
 Co-initiated joint proposal review and co-funding for proposals in the area of thermo-related processes between NSF/DMII and NSF/CTS, 2004.
 Co-sponsored the CAREER proposal writing workshop, November 2004
 Co-sponsored the CAREER proposal writing workshop, May 2005.
 Co-sponsored the Predictive Modeling workshop, July 2005.
 Initiated and sponsored the Biomanufacturing workshop, June 2005.
 Member, Engineering workgroup on Cyberinfrastructure, 2005

Other Activities

Member, Advisory Board, New Trier High School Engineering Partnership, 2012 – present
Member, MIT Educational Council, 2012 - present
Judge, Student Oral Presentation and Posters, HBCU-UP conference, Washington, D.C., October 2007.
Professeur invité, L'Institut National Des Sciences Appliquees de Lyon, France, June – Sept. 2007.
Member, Strategic Planning Committee, School District 37, Illinois, 2003.
Activity officer of the Mechanical Engineering Women Graduate Association, MIT, 1994-1995.
Selected participant for the NSF New Century Scholars Workshop, Stanford University, August 2-7, 1998.

COURSES LECTURED

Graduate Courses:

ME-445: Micromanufacturing
ME-441: Optimization in Manufacturing Processes
ME-442: Advanced Metal Forming
ME-495: Mechanics of Manufacturing Processes

Undergraduate Courses:

ME-340-2: CAD/CAM
ME-340-1: Introduction to Manufacturing Processes
ME-240: Introduction to Mechanical Design & Manufacturing

STUDENTS GRADUATED

Ph.D. Students:

Hong Yao, Mechanical Engineering, June 2000, *Process Design and Failure Analysis of Three Dimensional Sheet Metal Forming Using Simplified Numerical and Analytical Models*, currently Sr. Research Engineer, Mittal Steel USA.
Xi Wang, Mechanical Engineering, December 2000, *Stress-based Wrinkling Criteria and Experimental Verification in Sheet Metal Forming*, currently Senior Software Engineer, Nicksun, Inc.
Brad L. Kinsey, Mechanical Engineering, June 2001, *A Combined Approach to Improve and Assess the Formability of Tailor Welded Blanks*, currently Professor and Chair, University of New Hampshire, Durham. NSF CAREER award recipient.
Xiongqi Peng, Mechanical Engineering, December 2003, *Material Characterization and Stamping Simulation for Woven Composites*, currently Professor, Shanghai JiaoTong University, China.
Thaweeapat Buranathiti, Mechanical Engineering, June 2005, *Design and Optimization under Uncertainty in Sheet Metal Forming Processes Constrained with Failure Analysis*, currently Associate Professor, King Mongkut's University of Technology, Thonburi.
Neil Krishnan, Mechanical Engineering, June 2006, *Microforming: Experimental Investigation of Size Effects in the Extrusion of Micropins*, currently Manager, Advanced Manufacturing Engineering, Sandvik Hyperion.

Shawn H. Cheng, Mechanical Engineering, December 2009, Experimental and Numerical Analysis of Material Deformation Behavior in Sheet Metals and Its Forming Process, currently CEO, HUPU.com, named one of the Nine Promising Young Entrepreneurs in China by Forbes.

Numpon Mahayotsanun, Mechanical Engineering, December 2010, Study of Size and Strain Rate Effects in the Micro-Extrusion Process, currently Lecturer at Khon Kaen University, Thailand.

Tiffany Davis Ling, Mechanical Engineering, December 2011, Mechanics and Control of Laser Surface Texturing and its Applications in Energy Efficiency and Production, was a Lead Senior Process Engineer at Honeywell Aerospace, now at University of St. Thomas.

Rui Zhou, Mechanical Engineering, December 2011, Process Mechanics and Design of Deformation-based Surface Texturing System, currently Senior Engineer at Apple Inc.

Rajiv Malhotra, Mechanical Engineering, June 2012, Formability and Toolpath Planning in Incremental Forming, currently at Rutgers as a tenure-track Assistant Professor.

James Magargee, Mechanical Engineering, June 2014, Mechanics of Electrically-Assisted Deformation in Metals, currently at 3M.

Ishan Saxena, Mechanical Engineering, December 2015, Laser Induced Plasma Micro-Patterning, currently at Intel.

Jacob Smith, Mechanical Engineering, February 2016, Computational Approaches for Analyzing Flexible Manufacturing Processes and Advanced Materials: Towards Understanding the Inherent Multiscale Multiphysical Phenomena, currently at Apple.

Xiaoli Wang, Mechanical Engineering, February 2016, Mechanics of Magnetostrictive Thin Film Deformation and Its Application in Active X-Ray Optics, currently as a faculty Zhejiang Institute of Technology.

Man Kwan Ng, Mechanical Engineering, December 2017, Fundamentals and Applications of Electrically-assisted Microrolling, currently as a post-doctoral fellow at Argonne National Laboratory.

M.S. Students:

Brad L. Kinsey, Mechanical Engineering, June 1998, *Process Control in Sheet Metal Forming*, currently Associate Professor, University of New Hampshire, Durham.

Nan Song, Mechanical Engineering, December 2000, *Springback Prediction of Straight Flanging Operation*, currently R&D Software Developer, Bloomberg, L.P.

Vikram Viswanathan, Mechanical Engineering, December 2000, *Experimental Investigation of Forming Limit Curve for Tailor Welded Blanks and Physical Implementation of Neural Network for Springback Control*, currently at Adobe.

Neil Krishnan, Mechanical Engineering, December 2003, *Estimation of optimal blank holder force trajectories in segmented binders using an ARMA model*, currently Manager, Advanced Manufacturing Engineering, Sandvik Hyperion.

Shawn Cheng, Mechanical Engineering, June 2004, *Experimental study on wrinkling characterization and an accelerated method for springback compensation*, currently a Ph.D. student at Northwestern.

Numpon Mahayotsanun, Mechanical Engineering, June 2005, Draw-in sensor for sheet metal forming, continued as a Ph.D. student at Northwestern.

Anthony Swanson, Mechanical Engineering, June 2006, Experimental analysis of die wear in deep drawing with nanometer precision, currently a consultant in Chicago.

Michael Beltran, Mechanical Engineering, December 2010, Investigation of the Incremental Forming Process at a Micro-Scale, currently a lab manager/lecture at Northwestern University, co-founder of Scimplicity LLC.

Tim Rockers, Mechanical Engineering, August 2012, Tension and compression test of a sheet metal.

Tim Velasquez, Mechanical Engineering, January 2013, Feasibility of Laser Surface Texturing for Friction Reduction in Surgical Blades.

Sifang Zhou, Mechanical Engineering, June 2013, Bulk Metallic Glasses for Micro-Rolling, at Mori Seiki.

Rui Xu, Mechanical Engineering, June 2014, Process Accuracy Improvement and Performance Study of Incremental Forming, continuing his Ph.D. study at Stanford.

Jiachen (Jackson) Xu, Mechanical Engineering, June 2014, currently at Apple, A Novel Method of Evaluating the Tensile and Compressive Behavior of Thin Metal Sheet Using a Transparent Device.

Yuanqiao Wu, Mechanical Engineering, Spring 2015.

Jintao Liu, Mechanical Engineering, June 2015, Laser Surface Processing: Laser Shock Peening and Biprism interference micromachining.

Satyabrata Mohanty, Mechanical Engineering, June 2015, Electrical Micro Manipulation of Jet Trajectory for Water Jet Based Micro-manufacturing.

Lingxuan Su, Mechanical Engineering, Fall 2015.

Tanvy Limaye, Mechanical Engineering, Fall 2015.

Gabriela Fratta, Mechanical Engineering, Spring 2016.

Ebot Etchu Ndip-Agbor, Mechanical Engineering, Summer 2016.

CURRENT RESEARCH PERSONNEL

Research Associate:

Dr. Qiang Zeng (2013 – present)

Post-doctoral Fellow:

Dr. Biao Liang (2016 – present)

Ph.D. Students:

Mr. Ebot Etchu Ndip-Agbor (expected 2017)
 Miss Sarah Wolff (expected 2018)
 Miss Zixuan (Zoe) Zhang (expected 2018)
 Mr. Newell Moser (expected 2018)
 Mr. Huaqing Ren (expected 2018)
 Mr. David Pritchett (expected 2018)
 Mr. Marco Giovannini (expected 2018)
 Mr. Daniel Garcia (expected 2019)
 Mr. Nicolas Martinez (expected 2019)
 Miss Jennifer Bennett (expected 2019)
 Mr. Weizhao Zhang (expected 2020)
 Mr. Yi Shi (expected 2020)
 Miss Zilin Zhang (expected 2021)
 Mr. Dohyun Leem (expected 2021)

M.S. Students:

Miss Xiaoting Shi (expected 2017)
 Mr. Haiguang Liao (expected 2018)

Undergraduate Students:

Mr. Carter Robinson (expected 2017)
 Mr. Daniel Tian (expected 2018)
 Mr. Brandon Bay (expected 2017)

Visiting Scholars > 5

RESEARCH PERSONNEL SUPERVISED

Post-doctoral Fellows:

| | |
|--------------------------|---------------|
| Dr. Xiaoli Wang | (2016 – 2017) |
| Dr. Taekyung (Terry) Lee | (2015 – 2015) |
| Dr. Rajiv Malhotra | (2012 - 2013) |
| Dr. Ying Huang | (2006 – 2009) |
| Dr. Wonoh Lee | (2006 – 2008) |
| Dr. Shunping Li | (2000 – 2005) |
| Dr. Kum Cheol Shin | (2003 – 2004) |
| Dr. Hongsheng Lu | (2002 – 2004) |
| Dr. Xue (Patricia) Pu | (2000 – 2002) |
| Dr. Zhihong Liu | (1998 – 1999) |
| Dr. Choong Ho Lee | (1998 - 1999) |

Visiting Scholars:

| | |
|-------------------------------|---------------|
| Dr. Xifeng Li | 2011 - 2012 |
| Prof. Yun Wang | (2008) |
| Prof. Xudong Kang | (2008) |
| Prof. Zhong Wang | (2003 – 2004) |
| Dr. Riccardo Ruffini | (1997) |
| Mr. Steffen Hägebarth | (2004) |
| Mr. Anupam Agrawal | (2006) |
| Prof. Venkat Reddy | (2006 – 2007) |
| Prof. Yongjun Wang | (2007 – 2008) |
| Mr. Ning Ma | 2009 – 2010 |
| Prof. Chun Xu | 2010 – 2011 |
| Mr. Weichao Wu | 2009 – 2011 |
| Mr. Deniz Akturk | 2012 – 2012 |
| Mr. Dongkai Xu | 2010 – 2012 |
| Ms. Fan Rong | 2010 – 2013 |
| Prof. Xie Le | 2014 |
| Ms. Lanyun Li | 2014-2015 |
| Mr. Youqiang Xing | 2015-2016 |
| Mr. Wei Wang | 2014-2015 |
| Mr. Xinwei Wang | 2014-2015 |
| Ms. Beatrice Valoppi | 2015 |
| Mr. Antonio Jose Sanchez Egea | 2015-2016 |
| Miss Huan Zhang | 2014-2016 |
| Mr. Wule Zhu | 2015-2016 |

Undergraduate Students:

| | |
|----------------------------|------------------|
| Miss Mikenzie Steffens | (graduated 1999) |
| Mr. Joseph Goode | (graduated 2000) |
| Mr. Francis Joe Mills | (graduated 2001) |
| Mr. Alexander J. Ellis | (graduated 2002) |
| Mr. Peter J. Leonard | (graduated 2002) |
| Mr. Sasawat Mahabunphachai | (graduated 2002) |
| Mr. Ibrahim Khalid Sahouh | (graduated 2008) |
| Miss Kristi Bond | (graduated 2008) |
| Miss Julia Padvoiskis | (graduated 2008) |
| Mr. Phillip Ahn | (graduated 2008) |

| | |
|-------------------------------|------------------|
| Mr. Ben Schriesheim | (graduated 2008) |
| Mr. Drew Price | (graduated 2009) |
| Miss Rachel Cohen | (graduated 2010) |
| Mr. KrystianZimowski | (graduated 2010) |
| Miss Regan Radcliffe | (graduated 2011) |
| Mr. Kevin Yngve | (graduated 2011) |
| Mr. Stephen Guerin | (graduated 2011) |
| Mr. Jeffrey Shih | (graduated 2011) |
| Miss Morgan McHugh | (graduated 2011) |
| Mr. Andrew Nelson | (graduated 2011) |
| Miss Brooke Stanislawski | (graduated 2012) |
| Miss Eliza Bifano | (graduated 2012) |
| Mr. Justin Panhans | (graduated 2012) |
| Miss Sarah Wolff | (graduated 2013) |
| Mr. Max Abecassis | (graduated 2014) |
| Mr. Olatunde Olufisayo Okeowo | (graduated 2015) |

AWARDS STUDENTS RECEIVED

Presidential Fellowship is the most prestigious fellowship that Northwestern offers to graduate students. Typically, no more than eight Ph.D. students across the university receive this honor each year.

Terminal Year Cabell Fellowship is the most prestigious fellowship that McCormick School of Engineering offers to Ph.D. students in their final year.

Ryan Fellowship awards are for the best graduate students working in the exploration of fundamental nanoscale science and turning this knowledge into practical applications for the benefit of society.

Martin Fellowship awards are made to no more than three mid-career Ph.D. students in the Department of Mechanical Engineering.

NSF Fellowship refers to the NSF Graduate Research Fellowship.

Brad L. Kinsey, ASME Student Design Manufacturing Competition, 3rd Place, 1998

Xi Wang, Terminal Year Cabell Fellowship, Northwestern University, 2000.

Xiongqi Peng, Terminal Year Cabell Fellowship, Northwestern University, 2003.

Numpon Mahayotsanun, NADDRG Student Presentation Award, 2007

Tiffany Davis, NU Research Implementation Award, 2007

Tiffany Davis, NSF Fellowship, 2007

Michael Beltran, NSF Fellowship Honorable Mention, 2008

Ibrahim Khalid Sahouh, Undergraduate Research and Innovation Award, Mechanical Engineering, Northwestern University, 2008

Huang, Y., Cao, J., Smith, S., Woody, B., Ziegert, J., and Li, M., Finalist, Best Paper Award, "Studies of Size Effect on the Formability of a Domed Part in Incremental Forming", MSEC-72545, Proceedings of the 2008 International Manufacturing Science and Engineering Conference, MSEC2008, October 7-10, 2008, Evanston, Illinois, USA.

Rui Zhou and Ibrahim K. Sahouh, 3rd place, 2008 ASME Student Manufacturing Design Competition, MSEC 2008, October 7-10, 2008, Evanston, Illinois, USA.

Rajiv Malhotra, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2009.

Tiffany Davis, Presidential Fellowship, Northwestern University, 2010.

Krystian Zimowski, Undergraduate Research and Innovation Award, Mechanical Engineering, Northwestern University, 2010

Rui Zhou, ISEN (The Initiative for Sustainability and Energy at Northwestern) Fellowship, Northwestern University, 2010.

Rui Zhou, Terminal Year Cabell Fellowship, 2010

James Magargee, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2010 - 2011.

James Magargee and Morgan McHugh, 3rd place, 2010 ASME Student Manufacturing Design Competition, MSEC 2010, October, 2010, Erie, PA, USA.

Rajiv Malhotra, 2012 Best Poster Award, North America Deep Drawing Research Group, May, 2012, Oakland, MI.

Luke Francis Hemenetz and Tim Rockers, 2nd place, 2012 ASME Student Manufacturing Design Competition, MSEC 2012, June 2012, Notre Dame, USA.

James Magargee, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2010 - 2011.

Jacob L. Smith, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2012 - 2013.

Trista (Man Kwan) Ng, Honorable Mention, Martin Fellowship, Northwestern University, 2013.

Trista (Man Kwan) Ng, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2013 - 2014.

Jacob L. Smith, National Defense Science and Engineering Fellowship, US Department of Defense, 2013 – 2016.

James Magargee, ME Department Graduate Leadership and Service Award, 2013.

Newell Moser, National Science Foundation Graduate Fellowship, 2014 – 2017.

Jacob L. Smith, Martin Fellowship, Mechanical Engineering, Northwestern, 2014.

Zixuan Zhang, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2014-2015.

Sarah Wolff, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2014-2015.

Xiaoli Wang, Cabell Fellowship, McCormick, Northwestern University, 2015.

Ebot Etchu Ndip-Agbor, Martin Fellowship, Mechanical Engineering, Northwestern University, 2015.

Jennifer Bennett, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2014-2015.

Marco Giovannini, Ryan Fellowship, Northwestern University, 2015

Sarah Wolff, SME North America Manufacturing Research Conference Student Best Presentation Award, 2nd round-up, 2016

Newell Moser, Martin Fellowship, Mechanical Engineering, Northwestern University, 2016.

Mojtaba Mozaffar, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2016.

Weizhao Zhang, Predictive Science and Engineering Design (PSED) Fellowship, Northwestern University, 2016.

Daniel Garcia, Presidential Fellowship, Northwestern University, 2017.

Newell Moser, Royal E. Cabell Terminal Year Fellowship, McCormick School of Engineering and Applied Science, Northwestern University, 2017.

Ebot Etchu Ndip-Agbor, Honorary Terminal Year Fellow, McCormick School of Engineering and Applied Science, Northwestern University, 2017.

SPONSORED PROJECTS

A total of \$23.5 million research grant funding have been received by Cao and her collaborators at Northwestern since 1996, among which Cao's funding totals over \$12 million. Current projects are highlighted in light purple in tables below.

| No. | Project title | Sponsor | Role | Period |
|------------|--|----------------|-------------|---------------|
| 73** | CPS: Synergy: An Integrated Simulation and Process Control Platform for Distributed Manufacturing Process Chains (recommended for award) | NSF | co-PI | 12/16 – 11/19 |
| 72** | Rapid Process Certification and Verification for High-Value-Added and Low-Volume Production | DMDII | PI | 8/16 – 2/18 |
| 71** | OSCM: An Operating System for Cyberphysical Manufacturing | DMDII | PI | 8/16 – 2/18 |

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| 70* | Agile-1: Incremental Forming (subcontracted from LIFT, award being setup) | DoD | PI | 8/16 – 7/18 |
| 69 | I/UCRC Planning grant | NSF | PI | 07/16 – 08/17 |
| 68** | NIAC: Further Development of Aperture: A Precise Extremely large Reflective Telescope Using Re-configurable Elements | NASA | co-PI | 07/16 – 06/18 |
| 67** | Elastic-Cloud Based Make | DMDII | co-PI | 04/16 – 03/17 |
| 66** | Magnetically-assisted laser-induced plasma micro-machining for flexible and fast texturing of functional surfaces | NSF | co-PI | 06/16 – 05/19 |
| 65** | Electrically-Assisted Tubing Processes for Enhancing Manufacturability of Oxide Dispersion Strengthened Structural Materials for Nuclear Reactor Applications | DOE | PI | 09/15 – 08/18 |
| 64** | Electric Field Guided Micro Additive Manufacturing Process | NSF | Co-PI | 07/15 – 06/18 |
| 63 | Understanding the effect of continuous electrical current on assisting material deformation and its resulting microstructure | NSF | PI | 04/15 – 03/18 |
| 62** | Integrated Computation Materials Engineering (ICME) Development of Carbon Fiber Composites for Lightweight Vehicles (subcontract from Ford) | DOE | PI | 10/14- 09/18 |
| 61** | MRI: Instrument Development: Additive Rapid Prototyping Instrument (ARPI) | NSF | Co-PI | 7/14 – 6/17 |
| 60* | Development of Roadmap and Consortium for Innovation in Sheet Metal Forming | NIST | PI | 6/14 – 5/18 |
| 59** | Hybrid Tri-pyramid Robot: A Novel Type of Double-Sided Incremental Forming Machine | NSF | PI | 5/14 – 11/16 |
| 58** | 3D Near Field e-Writing with Submicron Resolution | NSF | PI | 6/14 – 5/18 |
| 57* | Manufacturing Processes Enhancement | Hu-Friedy | PI | 1/14 – 12/16 |
| 56** | Development and Validation of Physics-Based Additive Manufacturing Models For Process Control and Quality Assurance | NIST | PI | 10/13 – 6/16 |
| 55* | Process Modeling and Enhancements of Laser-Induced Plasma Micro-Machining (LIP-MM) | NSF | Co-PI | 9/13 – 8/15 |

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| 54 | Workshop on Future Research Needs in Advanced Manufacturing from Industrial Perspective; Arlington, Virginia; 11-13 August 2013 | NSF | PI | 3/13 – 2/14 |
| 53* | Rapid Freeform Sheet Metal Forming: Technology Development and System Verification (subcontracted from Ford) | DOE | PI | 7/13 – 03/16 |
| 52* | Curved Waterjet-Guided Laser Micro-Manufacturing | NSF | Co-PI | 9/12-8/16 |
| 51** | EAGER: Cloud-Computing and High-Speed Internet Enabled Manufacturing | NSF | PI | 9/11-8/13 |
| 50** | Improving the performance of X-ray optics with magnetostrictive films | NASA | co-PI | 3/11 – 3/16 |
| 49 | GOALI/Collaborative Research: Electrically-Enhanced Precision MicroRolling | NSF | PI | 4/11 – 3/16 |
| 48* | Multi-Physics Based Micro Texturing (MP-M2) Technologies for Biomedical Products | KIMM | Co-PI | 11/10 – 10/15 |
| 47 | Study on Shaping Titanium Electrode | GE | PI | 11/10-06/11 |
| 46 | Friction Characterization of EDT sheets | Ford | PI | 06/10- 09/10 |
| 45** | Engineering Bacteria-Proof Textured Steel Alloys for Medical Applications | Baxter | PI | 09/10-08/11 |
| 44 | A Hybrid Forming System: Electrical-Assisted Double Side Incremental Forming (EADSIF) Process for Enhanced Formability and Geometrical Flexibility | DOE | PI | 07/10 – 01/12 |
| 43 | Conference: The 2010 International Symposium on Flexible Automation; Tokyo; Japan; July 12 - 14, 2010 | NSF | PI | 03/10 – 06/11 |
| 42** | MRI: Development of a State-of-the-Art Laser Micro-machining and Surface Engineering System | NSF | Co-PI | 9/09 – 8/11 |
| 41** | PFI: Laser-based Manufacturing and Materials Processing | NSF | co-PI | 9/09 – 8/11 |
| 40 | Variation Control in Micro-stamping | NSF | PI | 9/09 – 8/13 |
| 39 | Incremental Forming at Multi-scales – RET supplement | NSF | PI | 9/08 -8/13 |

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| 38 | Exploratory Study on Shaping Titanium Electrode | GE | PI | 4/09 – 6/09 |
| 37 | Continuous Micro Roll Forming to Enable Energy Efficiency Devices | NU/ISEN | PI | 5/09 – 9/ 09 |
| 36* | Collaborative Research: Deformation Machining - A New Hybrid Process – REU supplement | NSF | Co-PI | 04/08 – 03/10 |
| 35 | An Investigation of Surface Distortion of Line Dies - supplement | GM | PI | 11/06-10/08 |
| 34* | GOALI/Collaborative Research: Integrated Sensing System for Stamping Monitoring and Control – supplement | NSF | PI | 9/06 – 8/08 |
| 33** | A Bayesian Treatment of Uncertainty in Simulation-Based Methods for Enhancing Process and Product Robustness | NSF | Co-PI | 06/08 – 06/12 |
| 32* | Collaborative Research: Deformation Machining - A New Hybrid Process | NSF | Co-PI | 04/08 – 03/10 |
| 31 | Incremental Forming at Multi-scales | NSF | PI | 9/07-8/13 |
| 30** | NSF Summer Institute on Nano-Mechanics, Nano-Materials and Micro/Nano-Manufacturing | NSF | Co-PI | 10/07-9/13 |
| 29* | Center for Multi-scale Virtual Design and Manufacturing | DOE/ ORNL | Co-PI | 5/07-5/09 |
| 28** | CI-TEAM Implementation Project: Collaborative Research-A National Engineering Dissection Cyber-Collaboratory | NSF | Co-PI | 1/07 – 12/08 |
| 27 | An Investigation of Surface Distortion of Line Dies | GM | PI | 11/06-03/08 |
| 26* | Enhancing Interface Performance Through Surface Texturing | Boeing & Ford | PI | 10/06 – 7/11 |
| 25* | GOALI/Collaborative Research: Integrated Sensing System for Stamping Monitoring and Control | NSF | PI | 9/06 – 8/08 |
| 24** | Building a State-of-the-Art Laser-Based Surface-Texturing Instrument | NSF | Co-PI | 9/06 – 8/08 |
| 23 | SGER/GOALI/Collaborative Research: Deformation Machining - A New Hybrid Process | NSF | PI | 5/06-4/08 |

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| 22 | Tool wear of high strength stamping die | Ford | PI | 9/05 – 8/08 |
| 21 | A Post-Process Tool for Detecting Surface Distortion in Stamping | GM | PI | 11/05 – 10/06 |
| 20 | Enhancing the understanding of the Fundamental Mechanisms of Thermostamping Woven Composites to Develop a Comprehensive Design Tool | NSF | PI | 6/03 – 5/08 |
| 19 | IREE Supplement to Collaborative Research: Enhancing the Understanding of the Fundamental Mechanisms of Thermostamping Woven Composites to Develop a Comprehensive Design Tool | NSF | PI | 8/05-5/08 |
| 18 | REU Supplement to Collaborative Research: Enhancing the Understanding of the Fundamental Mechanisms of Thermostamping Woven Composites to Develop a Comprehensive Design Tool | NSF | PI | 4/04 – 5/08 |
| 17 | Forming of Can Lid | REXAM | PI | 9/02 – 6/03 |
| 16 | Material Variability and Stamping Robustness | FORD | PI | 03/02- 02/05 |
| 15* | A Multi-Scale Approach for Predicting Wrinkling and its Experimental Validation | NSF | PI | 09/01-08/04 |
| 14 | Workshop on composite sheet forming | NSF | PI | 05/01-11/01 |
| 13 | An approach for model validation in simulating sheet metal forming processes | NSF | PI | 09/00 - 2/02 |
| 12* | Intelligent material and process design for stamping of structural composites | NSF | Co-PI | 04/99 - 03/02 |
| 11 | CAREER: Tooling design and failure analysis in sheet metal forming | NSF | PI | 07/97-06/02 |
| 10 | A stress-based wrinkling criterion and its experimental verification | NSF | PI | 09/97-08/01 |
| 9 | Composite sheet forming | FORD | PI | |
| 8 | CAREER matching fund | FORD | PI | |
| 7 | A study on soft coil issue | MSC | PI | 2001 |
| 6** | Design algorithm for optimizing stamping steps of axisymmetric parts | FORD | PI | 2000 |
| 5 | A simplified 2D model for predicting corner failure | GM | PI | 07/97-01/99 |

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| 4 | Wrinkling prediction | GE | PI | 3/97 - 12/98 |
| 3* | Springback Prediction | FORD | Co-PI | 03/98-03/99 |
| 2 | A study in sheet metal forming | ALCOA | PI | 1997 |
| 1 | A die design algorithm for stamping | NSF | PI | 06/96-09/97 |
| | TOTAL | | | |
| | Cao's TOTAL | | | |

* Two PIs on this project.

** Multiple PIs on this project.

PARTICIPATING RESEARCH CENTERS

| No. | Project title | Sponsor | Role | Period | Cao's Amount |
|-----|--------------------------|---------|------|--------------|--|
| 1 | NIST CoE: ChiMaD (\$25M) | NIST | seed | 1/15 – 12/17 | One student (not counted in the total) |