

Sinisa Dj. Mesarovic, Professor

School of Mechanical and Materials Engineering,
Washington State University, Pullman, WA 99164-2920

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PROFESSIONAL PREPARATION

PhD Engineering Sciences	<i>Harvard University</i> , Cambridge, Massachusetts, 1991-1996
MS Engineering Mechanics	<i>Case Western Reserve University</i> , Cleveland, Ohio, 1988-1990
Diploma Civil Engineering	<i>University of Belgrade</i> , Belgrade, Yugoslavia, 1981-1986

APPOINTMENTS

Professor	School of Mechanical and Materials Engineering, <i>Washington State University</i> , Pullman, Washington, 2014-present
Associate Professor	School of MME, <i>WSU</i> , Pullman, Washington, 2006-14
Assistant Professor	School of MME, <i>WSU</i> , Pullman, Washington, 2001-06
Senior Scientist	Department of Materials Science and Engineering, <i>University of Virginia</i> , Charlottesville, Virginia, 1999-2001
Research Associate	Department of Engineering, <i>University of Cambridge</i> , Cambridge, UK, 1996-1999

RESEARCH INTERESTS

Mathematical formulation of physical processes, with particular interest in multiscale models and computational methods, and with applications in both, materials processing and service. Specifically, current interests include:

- Plasticity of crystals and interfaces
- Micromechanics of granular materials
- Computational methods for coupled problems with moving boundaries:
 - Phase transformations high entropy alloys,
 - Diffusional creep in polycrystals,
 - Capillary flows.
- Collective behavior of carbon nanotubes
- Contact and adhesion mechanics on nanoscale

JOURNAL PUBLICATIONS

Download at <http://wsu.academia.edu/SinisaMesarovic/Papers>
or https://www.researchgate.net/profile/Sinisa_Mesarovic/publications

CURRENT CITATIONS: 1176 (Google scholar, April 2015)

- Mesarovic, S.Dj., Forest, S. & Jaric, J.P. 2015 Size-dependent energy in crystal plasticity and continuum dislocation models. *Proc. R. Soc. A* **471**, 20140868. <http://dx.doi.org/10.1098/rspa.2014.0868>
- Panigrahi, S.R., Jayaram, S., Jayaram, U., Zbib, H.M. & Mesarovic, S.Dj. 2014 Immersive 3D visualization of the collective behavior of particles and crystal dislocations using virtual reality technology. *Mod. Num. Sim. Mater. Sci.* **4**, 79-93. <http://dx.doi.org/10.4236/mnsms.2014.43010>
- Torabi, H., Radhakrishnan, H. & Mesarovic, S.Dj. 2014 Micromechanics of collective buckling in CNT turfs. *J. Mech. Phys. Solids* **72**, 144-160. <http://dx.doi.org/10.1016/j.jmps.2014.07.009>
- Radhakrishnan, H., Mesarovic, S.Dj., Qiu, A. & Bahr, D.F. 2013 Phenomenological constitutive model for a CNT turf. *Int. J. Solids Structures* **50**, 2224-2230. [doi: 10.1016/j.ijsolstr.2013.03.025](https://doi.org/10.1016/j.ijsolstr.2013.03.025) .
- Mesarovic, S.Dj., Padbidri, J.M, & Muhunthan, B. 2012 Micromechanics of dilatancy and critical state in granular matter. *Geotechnique Letters* **2**, 61-66. <http://dx.doi.org/10.1680/geolett.12.00015>
- Padbidri, J.M, Hansen, C.M, Mesarovic, S.Dj. & Muhunthan, B. 2012 Length scale for transmission of rotations in dense granular materials. *J. Appl. Mech.* **79**, 031011. doi: 10.1115/1.4005887
- Asle Zaeem, M., El Kadiri, H., Mesarovic, S.Dj., Horstemeyer, M.F. & Wang, P.T. 2011 Effect of the compositional strain on the diffusive interface thickness and on the phase transformation in a phase-field model for binary alloys. *J. Phase Equilibria and Diffusion* **32**, 302-308. [doi: 10.1007/s11669-011-9905-y](https://doi.org/10.1007/s11669-011-9905-y)
- Qiu, A., Bahr, D.F., Zbib, A.A., Bellou, A., Mesarovic, S.Dj., McClain, D., Hudson, W., Jiao, J., Kiener, D. & Cordill, M.J. 2011 Local and non-local behavior and coordinated buckling of CNT turfs. *Carbon* **49**, 1430-1438. [doi: 10.1016/j.carbon.2010.12.011](https://doi.org/10.1016/j.carbon.2010.12.011)
- Asle-Zaeem, M. & Mesarovic S.Dj. 2011 Morphological instabilities in thin films: Evolution maps. *Comp. Mater. Science.* **50**, 1030-1036. [doi: 10.1016/j.commatsci.2010.10.043](https://doi.org/10.1016/j.commatsci.2010.10.043)
- Padbidri, J. & Mesarovic S.Dj. 2011 Acceleration of DEM algorithm for quasistatic processes. *Int. J. Numer. Meth. Engng* 2011; **86**:816–828. [doi:10.1002/nme.3076](https://doi.org/10.1002/nme.3076)
- Mesarovic, S.Dj. 2010 Plasticity of crystals and interfaces: From discrete dislocations to size-dependent continuum theory. *Theor. Appl. Mechanics* **37**(4), 289-332. <http://www.ssm.org.rs/WebTAM/journal.html>

- Asle-Zaeem, M. & Mesarovic S.Dj. 2010 Finite Element Method for conserved phase fields: Stress-mediated diffusional phase transformation. *J. Comp. Phys.* **229**, 9135-9149. [doi:10.1016/j.jcp.2010.08.027](https://doi.org/10.1016/j.jcp.2010.08.027)
- Mesarovic, S.Dj., Baskaran, R. & Panchenko, A. 2010 Thermodynamic coarse-graining of dislocation mechanics and the size-dependent continuum crystal plasticity. *J. Mech. Phys. Solids* **58** (3), 311-329. [doi: 10.1016/j.jmps.2009.12.002](https://doi.org/10.1016/j.jmps.2009.12.002)
- Baskaran, R., Akarapu, S., Mesarovic, S.Dj. & Zbib, H.M. 2010 Energies and distributions of dislocations in stacked pile-ups. *Int. J. Solids Structures* **47**, 1144-1153. [doi:10.1016/j.ijsolstr.2010.01.007](https://doi.org/10.1016/j.ijsolstr.2010.01.007)
- Radhakrishnan, H. & Mesarovic, S.Dj. 2009 Adhesive contact of elastic spheres revisited: Numerical models and scaling. *Proc. Roy. Soc. A* **465**, 2231-2249. [doi:10.1098/rspa.2009.0118](https://doi.org/10.1098/rspa.2009.0118)
- Asle-Zaeem, M. & Mesarovic, S.Dj. 2009 Investigation of phase transformation in thin film using finite element method. *Solid State Phenomena* **150**, 29-41. [doi:10.4028/www.scientific.net/SSP.150.29](https://doi.org/10.4028/www.scientific.net/SSP.150.29)
- Zbib, A.A., Mesarovic, S.Dj., Lilleodden, E., McClain, D., Jiao, J. & Bahr, D.F. 2008 Coordinated buckling of carbon nanotube turf under uniform compression. *Nanotechnology* **19**, 175704. [doi:10.1088/0957-4484/19/17/175704](https://doi.org/10.1088/0957-4484/19/17/175704)
- Yassar, R.S., Mesarovic, S.Dj. & Field, D.P. 2007 Micromechanics of hardening of elastic-plastic crystals with elastic inclusions. I – Dilute concentration. *Int. J. Plasticity* **23**, 1901-1917. [doi:10.1016/j.ijplas.2007.03.013](https://doi.org/10.1016/j.ijplas.2007.03.013)
- McClain, D., Wu, J.F., Tavan, N., Jiao, J., McCarter, C.M., Richards, R.F., Mesarovic, S.Dj., Richards, C.D. & Bahr, D.F. 2007 Electrostatic shielding in patterned carbon nanotube field emission arrays. *J. Phys. Chem. C* **111**(20), 7514-7520. [doi:10.1021/jp067868h](https://doi.org/10.1021/jp067868h)
- Mesarovic, S.Dj., McCarter, C.M., Bahr, D.F., Radhakrishnan, H., Richards, R.F., Richards C.D., McClain, D. & Jiao, J. 2007 Mechanical behavior of a carbon nanotube turf. *Scripta Mat.* **56**, 157-160. [doi:10.1016/j.scriptamat.2006.09.021](https://doi.org/10.1016/j.scriptamat.2006.09.021)
- McCarter, C.M., Richards, R.F., Mesarovic, S.Dj., Richards, C.D., Bahr, D.F., McClain, D. & Jiao, J. 2006 Mechanical compliance of photolithographically defined vertically aligned carbon nanotube turf. *J. Mater. Science* **41**, 7872-7878. [doi:10.1007/s10853-006-0870-5](https://doi.org/10.1007/s10853-006-0870-5)
- Crabtree, O.I., Mesarovic, S.Dj., Richards, R.F., Bahr, D.F. & Richards, C.D. 2006 Nonlinear vibrations of a pre-stressed laminated thin plate. *Int. J. Mech. Sci.* **48**(4), 451-459. [doi:10.1016/j.ijmecsci.2005.10.001](https://doi.org/10.1016/j.ijmecsci.2005.10.001)
- Mesarovic, S.Dj. 2005 Energy, configurational forces and characteristic lengths associated with the continuum description of geometrically necessary dislocations. *Int. J. Plasticity* **21**, 1855-1889. [doi: 10.1016/j.ijplas.2004.09.002](https://doi.org/10.1016/j.ijplas.2004.09.002)
- Mesarovic, S.Dj. & Padbidri J. 2005 Minimal kinematic boundary conditions for simulations of disordered microstructures. *Phil. Mag.* **85**(1), 65-78. [doi: 10.1080/14786430412331313321](https://doi.org/10.1080/14786430412331313321)

- Mesarovic, S.Dj. 2005 Explosive crystallization of thin films. *J. Metall.* **11**(1), 23-39. <http://scindeks-clanci.nb.rs/data/pdf/0354-6306/2005/0354-63060501023M.pdf>
- Mesarovic, S.Dj. 2005 Micro-mechanical modeling of the compaction of low-density composite powders. *J. Metall.* **11**(1), 3-21. <http://scindeks-clanci.nb.rs/data/pdf/0354-6306/2005/0354-63060501003M.pdf>
- Mesarovic, S.Dj. 2001 Mapping the elastic-plastic contact and adhesion. In *Multi-scale Deformation and Fracture in Materials and Structures – The James R. Rice 60th Anniversary Volume*, 71-85. Chuang, T.-J. & Rudnicki J. W., Editors. Kluwer Academic Publishers. [doi:10.1007/0-306-46952-9_5](https://doi.org/10.1007/0-306-46952-9_5)
- Cabral, M.J., Lye, W.K., Bean, J.C., Reed, M.L., Chraska, T., Mesarovic, S.Dj., Hull, R. & Phillips, A.B. 2001 Induced crystallization as a nonlithographic pattern transfer technique for nanofabrications. *J. Vac. Sci. Technol. B* **19**(6), 2793-2796.
- Mesarovic, S.Dj. & Johnson, K.L. 2000 Adhesive contact of elastic-plastic spheres. *J. Mech. Phys. Solids* **48**, 2009-2033.
- Mesarovic, S.Dj. & Fleck N.A. 2000 Frictionless indentation of elastic-plastic spheres. *Int. J. Solids Structures* **37**, 7071-7091.
- Mesarovic, S.Dj. & Fleck N.A. 1999 Spherical indentation of elastic-plastic solids. *Proc. Roy. Soc. Lond. A* **455**, 2707-2728.
- Mesarovic, S.Dj. 1997 The influence of pre-existing dislocations on cleavage crack propagation behavior in crystals. *J. Mech. Phys. Solids* **45** (2), 211-238.
- Mesarovic, S.Dj. & Kysar, J.W. 1996 Continuum aspects of directionally dependent cracking of an interface between copper and alumina crystals. *Mech. Materials* **23**, 271-286.
- Wang, J.-S. & Mesarovic, S.Dj. 1995 Directional dependence of corrosion fatigue in iron-silicon bicrystals. *Acta metall. mater.* **43** (10), 3837-3849.
- Mesarovic, S.Dj. 1995 Dynamic strain ageing and plastic instabilities. *J. Mech. Phys. Solids* **43** (5), 671-700.
- Mesarovic, S.Dj. & Gasparini D.A. 1992 Dynamic behavior of a nonlinear cable system. I. Analytical formulation. *J. Eng. Mechanics ASCE* **118** (5), 890-903.
- Mesarovic, S.Dj. & Gasparini D.A. 1992 Dynamic behavior of a nonlinear cable system. II. Bifurcation and stability analyses. *J. Eng. Mechanics ASCE* **118** (5), 904-920.
- Mesarovic, S.Dj., Gasparini D.A., Muju, S. & McNelis, M. 1992 Probability of crack growth in a Poisson field of penny-shaped cracks. *J. Eng. Mechanics ASCE* **118** (5), 961-972.

SELECTED CONFERENCE PROCEEDINGS

- Fu, H., Dong, F., Sekulic, D.P., Mesarovic, S.DJ. & Krivilyov, M. 2013 Surface Tension Driven Kinetics of the Triple Line of a Liquid Metal Free Surface. *Proc. ASME*

- 2013 *International Mechanical Engineering Congress and Exposition*. Paper No. IMECE2013-62945, pp. Vo7ATo8Ao26; 8 pages. doi:10.1115/IMECE2013-62945
- Mesarovic, S.Dj., Paddidri, J.M., Muhunthan, B. 2013 Micromechanics of dilatancy, critical state and shear bands in dense granular matter. *Poromechanics V: Proceedings of the Fifth Biot Conference on Poromechanics*. Vienna, Austria, 2013
- Radhakrishnan, H., Mesarovic, S.Dj., Qiu, A. & Bahr, D.F. 2012 Multiscale modeling of collective behavior of carbon nanotubes. *Proc. ICDM 1 -1st International Conference on Damage Mechanics*, Belgrade, Serbia, 2012.
- Mesarovic, S.Dj. & Baskaran, R. 2012 Plasticity of crystals and interfaces: from dislocation mechanics to size-dependent continuum. *Proc. ICDM 1 -1st International Conference on Damage Mechanics*, Belgrade, Serbia, 2012.
- Mesarovic, S. Dj., Baskaran, R. 2011 [Interfaces in Size-Dependent Crystal Plasticity](#), *Proc. 3rd Int. Conf. on Heterogeneous Material Mechanics (ICHMM-2011)* May 22-26, 2011, Shanghai (ChongMing Island), China
- Asle Zaeem, M., El Kadiri, H., Mesarovic, S.Dj., Wang, P.T., Horstemeyer, M.F. 2011 A finite element-phase field study of solid state phase transformation: Coarsening of coherent precipitates and instability of multilayer thin films. *TMS Proceedings*, Vol **3**, General paper selection, 341-348.
- Asle-Zaeem, M., Mesarovic, S.Dj., El Kadiri, H. & Wang, P.T. 2010 A phase-field – finite element model for instabilities in multilayer thin films. To appear in *MRS Proceedings* **1297**(1) (MRS Fall meeting, Boston, 2010).
- Mesarovic, S, Dj & Paddidri, J. 2008 Transition between the models in multiscale simulations: Continuum and network models. In *Proc. CP73 Multiscale & Functionally Graded Materials*, 2006, G.H. Paulino et al, eds. 171-177.
<http://proceedings.aip.org/proceedings/cpcr.jsp>
- Zbib, A.A., Mesarovic, S.Dj., Bahr, D.F., Lilleodden, E., Jiao, J. & McClain, D. 2008 Indentation response of a nanostructured turf. *Mat. Res. Soc. Symp. Proc.* **1049**, AA02-08.
- Mihailovic, M., Raic, K.T., Mesarovic, S.Dj. & Volkov-Husovic, T. 2007 Multiscale modeling of wetting during metal-ceramic joining. *Proc. 10th ECerS Conf.*, 101-105, Berlin 2007, J.G.Heinrich and C. Aneziris, eds., Göller Verlag, Baden-Baden. ISBN: 3-87264-022-4
- Yassar, R.S., Field, D.P. & Mesarovic, S.Dj. 2005 Crystal plasticity modeling for texture development in precipitation hardening alloys. *Proc. Plasticity 2005*, 11th International Symposium on Plasticity and Its Current Applications January 2005, Kauai, Hawaii.
- Mesarovic, S.Dj. 2005 Transition between the scales in Multiscale modeling and simulation. *Proc.McMat 2005*, Joint ASME/ASCE/SES Conf. on Mechanics and Materials, June 2005, Baton Rouge, LA, 194:1-6.

- Crabtree, O.I., Richards, C.D., Mesarovic, S.Dj., Richards, R.F., Bahr, D.F. & Demir, I.
2004 Numerical modeling of a nonlinear MEMS membrane. *Proc. ASME IMECE*
Nov. 2004, Anaheim, CA, IMECE2004-61760.
- Mesarovic, S.Dj. 1996 Effects of externally generated dislocations on brittleness /
ductility of crystals. *Mat. Res. Soc. Symp. Proc.* **409**, 63-68.

PROFESSIONAL ACTIVITIES

Membership in professional societies:

*Materials Research Society, American Society of Mechanical Engineers,
American Association for Advancement of Science, American Society for
Engineering Education, The Minerals, Metals and Materials society, Serbian
Society of Applied Mechanics*

Committees: *ASME AMD/MD Joint Committee for Constitutive Equations.
ASME AMD Committee for Fracture*

Symposium Co-organizer: *Mechanics on the Nano and Micro Scales.* ASME Congress
2004

Editorial Board: *Journal of Theoretical and Applied Mechanics*

Scientific Committee: *1st International Conference on Damage Mechanics 2012
2nd International Conference on Damage Mechanics 2015*

Reviewer: *J. Mech. Phys. Solids, J. Mater. Sci., Int. J. Solids Structures,
Acta Mater., J. Appl. Mech., Proc. Roy. Soc. London, Int. J. Plasticity,
Phil. Mag., Mech. Mater., J. Metallurgy, Theor. Appl. Mechanics,
J. Eng. Mater. Technology, J. Sound Vibration, J. Tribology,
Int. J. Multiscale Comp. Eng., IEEE Trans Nanotechnology,
Computers, Materials and Continua, Int. J. Numer. Methods Eng.,
Appl. Math. Modelling, Mod. Sim. Mater. Sci. Eng., ZAMM, European J.
Mechanics-A, Finite Elements Anal. Design*

SERVICE TO THE SCHOOL AND UNIVERSITY

Chair of Graduate Studies Committee and Associate Director, School of Mechanical and
Materials Engineering, WSU, Fall 2009-Summer 2011. Major accomplishments
include:

- Developed ME Graduate Programs Bylaws
- Developed ME & MSE Graduate Programs Outcomes Assessment Plan and Methods
- Developed new PhD program requirements

- Developed Graduate Certificate in Nuclear Engineering
- Formulated International Agreement for Dual PhD Program between WSU - University of Paris-Est

Director and Founder, MME Computing Center, 2006-present.

Member of either Graduate or Undergraduate Studies Committee, 2001–2009.

Advisor to ASME Student Chapter, 2004–2006

University Graduate Studies Committee, Washington State University, 2010-2012.

SELECTED EDUCATIONAL ACTIVITIES

2006 Developed a multidisciplinary graduate course: ME/MSE 520 *Multiscale modeling in thermomechanics of materials*.

2010/2011 Three short (one week) courses at
University of Kragujevac (2010) and
University of Novi Sad (2011),
funded by World University Service, Austria:

- *Dislocations and crystal plasticity*
- *Phase-field models in solids and fluids*
- *Multiscale modeling in thermomechanics of materials*

2005-2011 Advised 5 REU students funded either by NSF REU site grant or through NSF REU supplements to own grants.

AWARDS AND HONORS

Fulbright Scholar 2013/14.

Visiting Professor, Ecole des Mines, Paris, France, 2013

MTS Visiting Professor, University of Minnesota, Minneapolis, MN, 2009

Visiting Professor, University of Kragujevac, Serbia, 2008-present

Outstanding teacher in Mechanical Engineering, Washington State Univ., 2004/05

SELECTED INVITED LECTURES

- Size-dependent plasticity of crystals and interfaces. Federation Francilienne de Mécanique, Séminaire Ile-de-France, Ecole des Mines, November, 2013
- Size-dependent plasticity of crystals. *Mechanics of Materials Workshop*. *Matematisches Forschungsinstitut Oberwolfach, Germany*, March 2012.
- Plasticity of crystals and interfaces: From dislocation mechanics to size-dependent continuum. *2nd International Conference on Materials Modelling (ICMM2) Paris*, France, September 2011.

- Micromechanics of dilatancy, critical state and shear bands in granular materials. *2nd International Conference on Materials Modelling (ICMM2) Paris, France, September 2011.*
- Interfaces in size-dependent crystal plasticity. *3rd International Conference on Heterogeneous Material Mechanics (ICHMM2011) Shanghai, China, May 2011.*
- Plasticity of crystals and interfaces: From discrete dislocations to size-dependent continuum theory. *UC San Diego, 2011.*
- Micromechanics of dilatancy and critical state in granular matter. *University of Minnesota, Minneapolis, MN, 2009.*
- Coarse-graining of dislocation energies and the continuum crystal plasticity. *Serbian Academy of Arts and Sciences, Belgrade, Serbia, 2007.*
- Transition between the models in multiscale modeling of materials. Continua and discrete models. *Rensselaer Polytechnic Institute, Troy, NY, 2007.*
- Transition between the models in multiscale modeling of materials. *Applied Mathematics Colloquia, MIT, Cambridge, MA, 2005.*
- Coarse-graining of dislocation energies and the continuum crystal plasticity. Engineering seminar. *Columbia University, New York, NY, 2005.*
- Micromechanical foundations of a nonlocal crystal plasticity. *International Conference on Plasticity, Hawaii, 2005.*
- Energy, configurational forces and characteristic lengths associated with the continuum description of geometrically necessary dislocations. *MRS Fall Meeting, Boston, MA, 2004.*
- Adhesive contact of elastic plastic solids. *Faculty of Mathematics, University of Belgrade, Serbia, 2002.*
- Explosive crystallization in thin films. *Faculty of Technology and Metallurgy, University of Belgrade, Serbia, 2002.*
- Micromechanics of powder compaction. *Faculty of Technology and Metallurgy, University of Belgrade, Serbia, 2001.*
- Mapping the elastic-plastic contact. *International Indentation Workshop II, Cambridge, UK, 2001.*
- Spherical indentation of elastic-plastic solids. *Hardness and Nanohardness Meeting. Institute of Physics, London, UK, 1998.*
- Dynamic strain ageing and plastic instabilities. *Materials Research Society Fall Meeting, Boston, MA, 1998.*

CONFERENCE PRESENTATIONS

- Over 50 conference presentations on international conferences in the last 10 years.