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EDUCATION:

Princeton University, Princeton, New Jersey.
PhD in Civil Engineering & Operations Research, 1993.
Major: Structures, Mechanics & Materials
Dissertation Title: "An effective medium approach to modeling inelastic structures with applications to Justinian's Hagia Sophia."
Dissertation adviser: Professor Ahmet S. Cakmak (retired)

University of Miami, Coral Gables, Florida.
M.S. in Ocean Engineering, June 1984.
Thesis Title: "Damping of surface gravity waves over natural seabeds"
Thesis adviser: Professor Bernard LeMehaute (deceased)

University of Maine, Orono, Maine.
B.S. in Civil Engineering, May 1982.

MEMBERSHIPS:

American Society of Civil Engineers, ASCE
American Society of Mechanical Engineers, ASME
American Institute of Aeronautics and Astronautics, AIAA
U.S. Association for Computational Mechanics
International Society for Structural and Multidisciplinary Optimization
The Fiber Society

HONORS:

- Robert and Virginia Wheeler Faculty Fellow of Engineering, Univ. of Iowa, 2004-2007
- Co-recipient of ASCE State-of-the-Art in Civil Engineering award for 2004 [as contributor to Recent Advances in Structural Optimization Burns, S. (Ed.), ASCE (2002)].
- Dean's List, The University of Maine, 1978-1982;
- Chi Epsilon Honor Society inductee, 1981;
- Graduated with *High Distinction*, The University of Maine;

PROFESSIONAL EXPERIENCE:

The University of Iowa:

Professor (8/06 – present); Associate Professor (8/99 – 7/06); Assistant Professor (8/93 - 7/99). Affiliated with Structures, Mechanics and Materials Program, and Center for Computer-Aided Design. Teaching graduate and undergraduate engineering courses in geomechanics, construction materials, foundation engineering, solid mechanics, and nonlinear computational mechanics. Supervising doctoral dissertation research and master's thesis research. Conducting research in topology design optimization of engineering materials and structures; computational homogenization of inelastic composites; effective medium constitutive modeling, computational mechanics; and biomechanics.

Princeton University, Princeton, New Jersey (9/88 - 6/93)

Graduate Research Assistant. Developed a vectorized and parallelized multi-purpose finite element code along with a graphics post-processing module for structural and continuum mechanics research applications. Used the software first to formulate effective medium plasticity and viscoplasticity models for composites and second to model the response of the fourteen-century-old masonry structure, the Hagia Sophia in Istanbul Turkey, to gravity seismic loading with the objective of preserving the structure in future earthquakes. Wrote proposals to obtain research funding and supercomputer time for dissertation research.

Graduate Teaching Assistant. Conducted precepts, held office hours and graded the following courses: C-Programming (twice), Geotechnical Engineering (once), Solid Mechanics (once), Structures and the Urban Environment (once). Also guest lectured for Advanced Finite Elements Course.

Pacifica Technology / SAIC, LaJolla, California (6/84 - 8/88)

Research Engineer. Analyzed and numerically modeled (in a supercomputing environment) the propagation of shock waves in geologic media (ice, water, rocks and soils). Developed numerical models with extensive comparisons to physical experiments. Developed nonlinear thermomechanical material constitutive models. Modeled the generation surface gravity waves by underwater bursts. Studied stress gauge inclusion effects and improved fielding techniques to improve accuracy of in-ground stress measurements. Wrote technical reports and competitive proposals.

University of Miami, Coral Gables, Florida (7/82 - 6/84)

Graduate Research Assistant. Studied and modeled the interaction surface waves with seabeds, looking specifically at oscillating turbulent boundary layers and the interaction of elastic waves in the seabed with surface gravity waves. Also performed wave tank experiments, wrote technical reports, proposals, and a Master's thesis.

PUBLICATIONS

Refereed and Archival Publications

1. C.C. Swan and A.S. Cakmak, "Nonlinear quasi-static and seismic of the Hagia Sophia," *Int. J. Soil. Dyn. Earthquake Engng.*, **12** (1993).
2. C.C. Swan and A.S. Cakmak, "A hardening orthotropic plasticity model for pressure-insensitive composites: continuum formulation and integration algorithm," *Int. J. Num. Meth. Engng.*, **37** 839-860 (1994).

3. C.C. Swan and A.S. Cakmak, "Homogenization and effective plasticity models for periodic composites," *Comm. Num. Meth. Engng*., **10**(3) 257-265 (1994).
4. C.C. Swan, "Techniques for stress and strain controlled homogenization of inelastic periodic composites," *Comput. Meth. Appl. Mech. Engng*. **117** 249-267 (1994).
5. C. Swan and I. Kosaka, "A design method for high-performance composites," in Fiber Composites in Infrastructure , H. Saadatmanesh and M. Eshani (Eds.) 723-736 (1996).
6. C.C. Swan and I. Kosaka, "Homogenization-based analysis and design of composites," *Comput. & Struct.*, **64**(1-4) 603-621 (1997).
7. C.C. Swan and J.S. Arora, "Topology design of material layout in structured composites of high stiffness and strength," *Structural Optimization* **13**(1) 45-59 (1997).
8. C.C. Swan and I. Kosaka, "Voigt-Reuss topology optimization for structures with linear elastic material behaviors," *Int. J. Numer. Meth. Engng.*, **40** 3033-3057 (1997).
9. C.C. Swan and I. Kosaka, "Voigt-Reuss topology optimization for structures with nonlinear material behaviors," *Int. J. Numer. Meth. Engng.,* **40** 3785-3814 (1997).
10. M. Brodt, C.C. Swan and T. Brown, "Mechanical behavior of human morsellized cancellous bone in triaxial compression," *J. Orthopaedic Res*, **16** 43-49 (1998).
11. C.C. Swan, "An engineering design perspective on refinement of implants to correct sagittal plane instabilities," (Point of View) *Spine* **22**(16) 1826 (1997).
12. A.R. Mijar, C.C. Swan, J.S. Arora and I. Kosaka, "Continuum topology optimization for concept design of frame bracing systems," *J. Struct. Engng*., **124**(5) 541-550 (1998).
13. I. Kosaka and C.C. Swan, "A symmetry reduction method for continuum structural topology optimization," *Comput. & Struct*. **70**(1) 47-61 (1999).
14. C.C. Swan and Y.-K. Seo, "Limit state analysis of earthen slopes using dual continuum/FEM approaches," *Int. J. Numer. Analy. Meth. Geomech*. **23** 1359-1371 (1999).
15. R.S. Lakes, C.C. Swan, E.B. Garner, and K. Stewart, "Experimental micromechanics and viscoelasticity of biological and protective materials," in Solid Mechanics and Its Applications, **69**, IUTAM Symposium on Bio-Solid Mechanics, P. Pedersen and M.P. Bendsoe (Eds.), Kluwer Academic Press, Dordrecht (1999).
16. E.B. Garner, R.S. Lakes, T. Lee, C.C. Swan, and R.A. Brand, "Viscoelastic dissipation in compact bone: implications for stress-induced flow in bone," *J. Biomech. Engng*. **122** 166-172 (2000).
17. M.A. Silva, C.C. Swan, J.S. Arora, and R. Brasil, "A new criterion for RC members under biaxial bending and axial load," *J. Struct. Engng*., **127**(8) 922-929 (2001).
18. Y.-K. Seo and C.C. Swan, "Load-factor stability analysis of embankments on saturated soil deposits," *J. Geotech.. Geoenv. Engng*., **127**(5) 436-445 (2001).
19. P. Buechner, R. Lakes, C. Swan and R. Brand, "A Broadband viscoelastic spectroscopic study of bovine bone: implications for fluid flow," *Annals Biomed. Engng.,* **29**(8) 719-28 (2001).
20. M.A. Silva, J.S. Arora, R. Brasil, and C.C. Swan, "Design of elevated RC foundations subjected to dynamic loadings," *J. Struct. Engng*., **128**(11) 1470-1479 (2002).
21. H.J. Kim, C.C. Swan, and R.S. Lakes, "Computational studies on high-stiffness, high-damping SiC-InSn particulate reinforced composites," *Int. J. Solids & Struct*. **39**(23) 5799-5812 (2002).
22. M.N. Ludwigson, C.C. Swan, and R.S. Lakes, "Damping and stiffness of particulate SiC-InSn composite," *J. Composite Mat*. **36** 2245-2254 (2002).
23. H.J. Kim and C.C. Swan, "Voxel-based meshing and unit cell analysis of textile composites," *Int. J. Numer. Meth. Engng*. **56**(7) 977-1006 (2003).
24. C.C. Swan, R.S. Lakes, R.A. Brand, and K.J. Stewart, "Micromechanically based poroelastic modeling of fluid flow in Haversian bone," *J. Biomech. Engng*. **125** 25-37 (2003).

25. H.J. Kim and C.C. Swan, "Automated meshing and unit cell analysis of periodic composites with hierarchical quadratic tetrahedral elements," *Int. J. Numer. Meth. Engng.* **58**(11) 1683-1711 (2003).
26. S. Rahmatalla and C.C. Swan, "Form-finding of sparse structures using continuum topology optimization," J. *Struct. Engng*. **129**(12) 1707-16 (2003).
27. S. Rahmatalla and C.C. Swan, "Continuum structural topology of buckling-sensitive structures," *AIAA Journal* **41**(6) 1180-1189 (2003).
28. R.A. Brand, C.M. Stanford, and C.C. Swan, "How do tissues respond and adapt to stresses around a prosthesis? A primer on stress analysis for orthopedic surgeons." *The Iowa Orthopaedic Journal* **23**(13) 13-22 (2003).
29. S. Rahmatalla and C.C. Swan, "A Q4/Q4 continuum structural optimization implementation" *Struct. & Multidisc. Optim*. 27(1-2) 130-135 (2004).
30. S. Rahmatalla and C.C. Swan, "Sparse monolithic compliant mechanisms using continuum structural topology optimization" *Int. J. Numer. Meth. Engng*. **62**:1579-605 (2005).
31. S. Gururaja, H.J. Kim, C.C. Swan, R.A. Brand and R.S. Lakes, "Modeling deformation-induced fluid flow in cortical bone's lacunar-canalicular system," *Annals of Biomedical Engng.* **33**(1):7-25 (2005).
32. S. Rahmatalla, H.J. Kim, M. Shanahan, C.C. Swan, " Effect of Restrictive Clothing on Balance and Gait using Motion Capture and Dynamic Analysis", Paper# 2005-01-2688, *SAE 2005 Transactions Journal of Passenger Cars-Electronic and Electrical Systems* (March 2006).
33. H. Kim, Q. Wang, S. Rahmatalla, C.C. Swan, J.S. Arora, K.A. Malek, and J.G. Assouline, "Dynamic motion planning of 3D human locomotion using gradient-based optimization," *J. Biomechanical Engineering* (2007). *In press*.
34. X. Man and C.C. Swan, "A mathematical modeling framework for analysis of functional clothing," *Journal of Engineered Fibers and Fabrics*, (2007). *Accepted for publication*.

Manuscripts in Review

35. Y. Kim, C.C. Swan, and J.-S. Chen, "Performance of parallel conjugate gradient solvers in meshfree analysis of nonlinear continua," *Computational Mechanics* (2006).
36. S. Rahmatalla and C.C. Swan, "Topological design and nonlinear control of path-following compliant mechanisms." *Comput. Meth. Appl. Mech. Engng*. (2006).

Chapters in Books:

1. C.C. Swan, "Unit cell analysis of 3-D graphitic textile-reinforced polymer matrix composites," in Advances in Composite Materials and Mechanics, Maji, A. (Ed.), ASCE (1999).
2. M. Ohsaki and C.C. Swan, "Topology and Geometry Optimization of Trusses and Frames," in Recent Advances in Structural Optimization Burns, S. (Ed.), ASCE (2002).
3. C.C. Swan and S. F. Rahmatalla, "Strategies for computational efficiency in continuum structural topology optimization," pp. 673-83 in Advances in Engineering Structures, Mechanics & Construction M. Pandey *et al.* (eds) published by Springer, Dordrecht, Netherlands (2006).

SELECTED SERVICE ACTIVITIES:

- NSF Panel reviewer for research proposals, 1997, 1999, 2000 (twice), 2001, 2002.

- Advisory Editor (1995-2000), *Spine*, a journal of biomechanics and surgical procedures for the human spine.
- Associate Editor, ASCE Journal of Structural Engineering, 2006-present.
- Iowa ASCE Geotechnical Engineering Conference Planning Committee, member 1996 – 2001; chair 1998 - 2001.
- Session developer (Advanced Technologies in Concept Design of Structures), 1999 & 2001 ASCE Structural Engineering Congresses.
- Session developer (Information Technology in Civil Engineering Education), 2002, 2006 ASCE Structural Engineering Congresses.
- ASCE Optimal Structural Design Committee, member since 1997, secretary 1999-2003.
- ASCE Emerging Computing Technologies Committee, member since 1996, vice-chair 2000-2002, chair 2002 – 2006.
- Coordinator of Structures, Mechanics & Materials Program, Civil & Environmental Engineering, University of Iowa 1999-2006.
- Chair, University of Iowa College of Engineering Curriculum Committee, 2001-2002 academic year.
- Member, 2001-2004 University of Iowa's Engineering Faculty Council (elected faculty governance body within College of Engineering). Chair of Council 2003-2004.

ONGOING OR RECENTLY COMPLETED RESEARCH PROJECTS:

Contract or Grant Title	Sponsor	Duration
Modeling of Clothing in Digital Human Models	U.S. Army (TACOM)	2003 -
Development of Digital Human Models for Design of Body Armor Systems	U.S. Army Natick Soldier Center	2005-2008
Dynamic Modeling of Protective Clothing Microclimate Volume	U.S. Army Natick Soldier Center	2007-2008