

*BIOGRAPHICAL SKETCH AND PROFESSIONAL ACTIVITIES*  
**RENSSELAER POLYTECHNIC INSTITUTE**  
SCHOOL OF ENGINEERING  
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

**GIANLUCA CUSATIS - Assistant Professor**

**I. EDUCATIONAL PREPARATION**

- Ph.D. degree in Structural Engineering, Department of Structural Engineering, Politecnico di Milano (Milan, Italy). Feb. 2002.
- “Laurea”<sup>1</sup> degree in Structural Engineering, Department of Structural Engineering, Politecnico di Milano (Milan, Italy). Jul. 1998.

**II. PROFESSIONAL EXPERIENCE**

- Assistant Professor. Department of Civil and Environmental Engineering, Rensselaer Polytechnic Institute (Troy NY, USA). Aug 2005 – Present.
- Research Associate. Department of Civil and Environmental Engineering, Northwestern University (Evanston IL, USA). Jun. 2004 – Jul. 2005.
- Research Associate. Department of Structural Engineering, Politecnico di Milano University (Milan, Italy). Apr. 2002 – Jun. 2004.
- Graduate Research and Teaching Assistant. Department of Structural Engineering, Politecnico di Milano University (Milan, Italy). Sep. 2000 – Mar. 2002.
- Visiting Scholar. Department of Civil and Environmental Engineering, Northwestern University, Evanston (IL), USA. Oct. 1999 – Aug. 2000.
- Graduate Research and Teaching Assistant. Department of Structural Engineering, Politecnico di Milano University (Milan, Italy). Sep. 1998 – Sep. 1999.

**III. HONORS AND AWARDS**

- Industry Stipend of Excellence Award. Sponsored by Lafarge Group and Electricité de France. Evaluation Committee: Prof. F.H Wittmann, Dr. P. Acker and Dr. B. Gerrard. ConCreep6@MIT, MIT, Cambridge, MA, USA. Aug. 2001.

**IV. TEACHING**

**A. SUMMARY OF TEACHING EXPERIENCE AND TEACHING PHILOSOPHY**

I started my teaching career in 1999, when, as a graduate TA, I was involved in several undergraduate courses of the civil engineering curriculum at the Politecnico di Milano University (Milan, Italy). After my doctoral graduation, at the same institution, I was charged with teaching a complete course dealing with the design of reinforced concrete structures.

Since August 2005, I have been teaching various courses of the undergraduate civil engineering curriculum at Rensselaer Polytechnic Institute (Rensselaer). In these years at Rensselaer I have always received good feedback on my teaching skills and I received very good teaching evaluations.

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<sup>1</sup> In the old Italian high educational system the “Laurea” degree was a five year degree equivalent to a baccalaureate degree plus a master degree.

Aiming at further improving my teaching skills I attended, in summer 2007, one of the ASCE ExCEED (Excellence in Civil Engineering Education) workshops offered every year. These workshops are one-week course that provides the participants with the foundation necessary for continued growth and development towards teaching excellence. After the workshop I implemented some of the teaching techniques that characterize the ExCEED model and the quality of my classes has significantly improved.

These techniques include, but are not limited to: 1) definition of a hierarchy of Learning Objectives for the course, for specific subjects covering several classes, and for each single class; 2) daily assessment of the level of class understanding of key concepts; 3) questioning techniques to maintain a high level of attention and engagement of the students; 4) techniques to stimulate student questions; 5) development of a good interpersonal rapport; 6) development of a low-threat, high-challenge, high-reward teaching environment; 7) encouraging frequent visits during office hours; 8) targeting in each class several different learning styles.

In addition to the classical in class activity I also try to integrate Education and Research. This is achieved though offering Independent Study opportunities and Undergraduate Research Projects on subjects closely related to my research. For example, in Spring '07 I offered an Independent Study on Concrete Mechanics in which the students involved (five undergraduate students) were required to read technical articles on the subject and prepare PowerPoint presentations to discuss with the rest of the group what they had learned. After that experience, one of those students continued to work with me and as part of a summer project she developed a database of experimental data for concrete. Such database is now being used by my research assistants for the calibration and validation of the computational models under development.

Furthermore, my teaching activity is completed by my advisor and mentor duties. I have supervised so far more than 20 undergraduate research projects, 5 "Laurea" theses, 3 Master of Science theses, and 4 PhD theses. Currently, I am also the academic advisor of about several undergraduate students.

Finally, I really believe that Teaching and Research should be considered as complementary aspects of a thorough academic activity. For these reason I have recently developed and offered a graduate course (Advanced Topics on Concrete Mechanics) that covers subjects closely related to my current research activity.

#### **B. COURSES TAUGHT AT RENSSELAER POLYTECHNIC INSTITUTE (TROY NY, USA)**

14. Experimental Concrete Mechanics, Independent Study, Fall'09, 5 students.
13. Introduction to Structural Engineering (CIVL 2670), Fall '09, 86 students. n/a- n/a - n/a<sup>2</sup>
12. Concrete Design, Spring '09 (CIVL 4080), 68 students. 4.4-4.3-3.7<sup>2</sup>
11. Advanced Topics on Concrete Mechanics, Fall '08 (CIVL 6961), 21 students. 4.4-4.3-3.5<sup>2</sup>
10. Introduction to Structural Engineering (CIVL 2670), Fall '08, 87 students. 4.3-4.3-4.3<sup>2</sup>
09. Concrete Testing, Independent Study, Fall '08, 1 student.
08. Advanced Structural Analysis (CIVL 4440), Spring '08, 41 students. 4.7-4.8-4.6<sup>2</sup>
07. Introduction to Structural Engineering (CIVL 2670), Fall '07, 73 students. 4.4-4.2-4.0<sup>2</sup>
06. Introduction to Bridge Engineering, Independent Study, Fall '07, 2 students.
05. Concrete Design, Spring '07 (CIVL 4080), 60 students. 4.5-4.5-4.4<sup>2</sup>
04. Mechanics of Concrete, Spring '07, 7 students.
03. Introduction to Structural Engineering (CIVL 2670), Fall '06, 82 students. 4.3-4.2-4.0<sup>2</sup>

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<sup>2</sup> IDEA raw scores for progress on relevant objectives, teacher evaluation, and course evaluation on a scale of 5. See attached student evaluations for details.

- 02. Structural Analysis (CIVL 4440), Spring '06, 14 students. 4.0-3.9-3.7<sup>2</sup>
- 01. Introduction to Structural Engineering (CIVL 2670), Fall '05, 69 students. 3.2-2.6-2.8<sup>2</sup>

**C. COURSES TAUGHT AT POLITECNICO DI MILANO (MILAN, ITALY)**

- 02. Laboratory of Design of Concrete Structures, Spring '04, ~90 students. 2.9/4.0
- 01. Laboratory of Design of Concrete Structures, Spring '03, ~90 students.

**D. COURSE AND CURRICULUM DEVELOPMENT**

- 2. Advanced Topics on Concrete Mechanics, CIVL 6961.
- 1. Advanced Structural Analysis, CIVL 4400.

**E. STUDENT SUPERVISION**

***Doctoral Theses***

- 4. Xinwei Zhou, "TBD", Rensselaer Polytechnic Institute, *Expected Completion Date*: August 2012.
- 3. Jovanca Lewis-Smith, "TBD", Rensselaer Polytechnic Institute, *Expected Completion Date*: August 2014.
- 2. Andrea Mencarelli, "Numerical Simulation of the Effect of Blast and Penetration on Reinforced Concrete Structures", Rensselaer Polytechnic Institute, *Expected Completion Date*: August 2010.
- 1. Edward A. Schauffert, "Discrete Approaches for Fracture and Fragmentation of Quasi-Brittle Materials". Rensselaer Polytechnic Institute, *Expected Completion Date*: August 2010.

***Master Theses***

- 5. Eric Dhal, "Experimental Investigation of the Mechanical Behavior of Concrete under Uniaxial and Multiaxial Stress States", Rensselaer Polytechnic Institute, *Expected Completion Date*: August 2009.
- 4. Daniel Horvath, "Microplane Modeling of Concrete and Other Quasi-Brittle Materials", Rensselaer Polytechnic Institute, *Expected Completion Date*: August 2009.
- 3. Andrea Mencarelli "Discrete Particle Model (LDPM) for Concrete: Calibration and Validation under Quasi-Static Loading Condition." Rensselaer Polytechnic Institute, December 2007.
- 2. Edward Schauffert, "Size Effect and Cohesive Crack propagation in Quasi-Brittle Materials." Rensselaer Polytechnic Institute, August 2007.
- 1. Miao Zhou "Spectral Particle Method (SPM) for Two-dimensional Cohesive Crack Propagation." Rensselaer Polytechnic Institute, August 2007.

***Undergraduate Projects at Rensselaer***

- 25. Caitlyn Coppinger, "Splitting Tests on Concrete". Summer 2009.
- 24. Anthony Vona, "Experimental testing of Concrete Strength". Summer 2009.
- 23. Edward Pomfred, "Simulation of Brazilian Tests on Concrete Specimens". Spring 2009.
- 22. Alexandra Gambarov, "LDPM Calibration and Validation". Spring 2009.
- 21. Jessica Gillett, "Concrete Behavior in Torsion". Spring 2009.
- 20. Angel Curillo, "Rate Effect on Concrete Strength". Spring 2009.
- 19. Caitlyn Coppinger, "Uniaxial Compression Tests". Spring 2009.
- 18. William DeGraaff, "Three-Point Bending Tests on Unnotched Specimens". Spring 2009.
- 17. Dan Livermore, "Brazilian Splitting Tests". Spring 2009.
- 16. Robert Vayda, "Triaxial Compression Tests". Spring 2009.
- 15. John Brucker, "Concrete Behavior under Extreme Loads". Spring 2009.

14. Kyle Sherman, "Simulation of Tensile Behavior of Concrete". Spring 2009.
13. Brian Dastis, "Concrete Behavior in Tension". Spring 2009.
12. Allen Marden, "Three-Point Bending Tests on Notched Specimens". Spring 2009.
11. Tequisha Hendrickson, "Uniaxial Compression Tests". Spring 2009.
10. Stephanie Egger, "Collections of Material Properties for a Concrete Database". Fall 2008.
09. William DeGraaff, "Three-point bending experiments". Fall 2008.
08. Tequisha Hendrickson, "Experiments on compressive failure and size effect". Fall 2008.
07. Alexandra Gambarov, "Blast and Penetration Mechanics". Fall 2008.
06. Richard George, "Experimental investigation of triaxial behavior of concrete". Spring 2008.
05. Noah Blum, "Fiber reinforced cementitious composites: literature review". Spring 2008.
04. Daniel Horvath, "Concrete literature review". Spring 2008.
03. Eric Dhal, "Development of a laboratory test program for determining mechanical properties of concrete". Spring 2008.
02. Eric Dhal, "Experimental investigation of concrete behavior". Spring 2008.
01. Angie Urena, "Development of a Database for Experimental Data of Concrete". Summer 2007.

***Undergraduate Projects at Politecnico di Milano***

03. Stefano Eccheli and Mario Roveda, "Development of software for non-linear analysis of reinforced concrete cross-sections". Fall 2004.
02. Anna Kunzle and Mario Solari, "Design of reinforced concrete structures: comparison between two different design methods". Spring 2003.
01. Valentina Capodici and Francesca Busnelli, "Reinforced concrete structures with a significant horizontal extension: effects of differential foundation settlements". Spring 2003.

***"Laurea" Thesis Supervision at Politecnico di Milano***

05. Michele Polli, "Meso-structural modeling for the simulation of concrete fracturing behavior" (in Italian). 2003
04. Antonio Carlucci, "Interaction between fracturing behavior of concrete and steel-concrete bond behavior in reinforced concrete structures" (in Italian). 2003.
03. Mario Pedroni and Marco Pisanu "Numerical simulation of concrete fracturing behavior: size effect and boundary condition effect" (in Italian). 2003.
02. Mirco Rosson and Marco Rota, "Numerical simulation of headed anchors in reinforced concrete structures" (in Italian). 2002.
01. Davide Galeotta and Marco Natale, "Numerical simulation of pull-out tests by using Microplane model" (in Italian). 2001.

## V. RESEARCH

### A. RESEARCH INTERESTS

The long term goal of my research is to develop effective and reliable computational technologies for the simulation of the failure behavior of materials and structures subjected to extreme environmental and loading conditions. The formulation of novel constitutive models with real predictive capability and the numerical implementation of effective computational techniques will enable new generations of engineers to design safer, more reliable, more durable, energy efficient, and environmentally friendly civil infrastructures.

Reliable computer simulations of material and structural failure require an accurate description of various phenomena spanning several length and time scales. These phenomena include nano/micro/meso-scale crack initiation, propagation along complex three-dimensional paths, effect of material heterogeneity, interaction and coalescence of distributed multi-cracks into localized cracks, temperature and humidity effects, loading rate effects, effect of confining pressure, interaction between damaged and undamaged material, etc.

The classical continuous (tensor based) representation of solids, although it has been used traditionally to address some of these aspects, is inherently incapable of modeling the loss of continuity associated with fracture. In recent years various computational technologies have been formulated to effectively handle displacement discontinuities but these techniques tend to be computationally intensive in the case of extensive three-dimensional fracturing as it occurs, for example, during fragmentation. For this reason my research has focused on the we adoption of a **discrete approach** in which solids are discretized “a priori” and the governing equations (equilibrium, compatibility, and constitutive behavior) are formulated directly in this discrete setting. Solids are represented by systems of discrete entities (discrete particles, lattice struts, etc.) whose size distribution and geometrical configuration are always linked to the topology of the main heterogeneities characterizing the internal structure of the material at the nano-, micro- and/or meso-scale.

Based on this idea my research group recently succeeded in the formulation of a comprehensive concrete model called **Lattice Discrete Particle Model (LDPM)**. LDPM has shown superior qualitatively and quantitatively modeling capabilities in a wide variety of loading conditions in both quasi-static and dynamic regime. In particular, LDPM has been successfully applied to the simulation of the performance of concrete and reinforced concrete structures under high impulsive loadings, such as blast and penetration. The outcomes of this research effort have been presented at various conferences and workshops and will be documented in a series of journal papers currently in preparation.

Currently, my research activity focuses on the extension and refinement of this work in many different directions as described below.

**Multiscale Modeling.** Even with the computational power currently available, the adoption of nano/micro/meso-scale (discrete) approaches become computationally intractable in the case of fine grained materials, such as nano-composites, ceramics, rocks, metallic powders, etc., or in the case of large structures, such as tall buildings, dams, bridges, etc. For this reason there is clearly a need for effective **multiscale techniques** suitable for upscaling discrete systems. My research group is currently exploring, evaluating the effectiveness, and further extending a variety of multiscale techniques recently developed to bridge atomistic and continuum scales.

**Composite Materials.** Development of energy efficient and environmentally friendly technologies is certainly the forefront of Engineering of the twenty-first Century. Design of high-strength, light-weight, and corrosion-resistant materials is the key, for example, for the design of energy-saving transportation systems (cars, aircrafts, ships, etc.). During my post-doc appointment I worked on the formulation of a general triaxial constitutive law for the simulation

of anisotropic elasticity, damage, and failure of quasi-brittle composites, such as carbon-epoxy and glass-epoxy composites. The model (called the Spectral Stiffness Microplane Model) was formulated in the context of the microplane theory and exploited the spectral decomposition of the stiffness matrix to identify orthogonal strain modes at the microplane level. Future extensions of that work will take into account the visco-elastic, rate- and temperature-dependent character of these materials in order to be able to simulate the behavior of mechanical components under high impulsive loading conditions.

**Structural Durability.** In addition to the research directions discussed above, I am also interested in working on structural durability which is a critical issue due to the aging of our National infrastructures. I have recently completed an international research project (in collaboration with an Italian University) aimed at the formulation of a comprehensive computational theory for concrete creep and shrinkage suitable for the analysis of concrete behavior at the early ages and beyond. The outcomes of this project is relevant, for example, to the assessment of durability and serviceability of reinforced (high-strength) concrete bridge decks, which, typically experience extensive cracking at the early ages. This cracking produces a direct path for corrosive agents to reach the reinforcing steel, which will then corrode reducing the load carrying capacity of the whole structures

## **B. EXTERNALLY SPONSORED RESEARCH PROJECTS**

- E9. Mesoscale Based Formulation of Microplane Model. U.S. Army Engineer Research and Development Center (ERDC). August 2009 – August 2010. PI: G. Cusatis. \$101,448.
- E8. Man-made Hazard Mitigation of Reservoir Dams: Monte Carlo Simulation with Multiscale Modeling of Concrete and Accurate Fluid-Structure Interaction. National Science Foundation. July 2009-July 2012. PI: G. Cusatis (60%), co-PI L. Zhang. \$260,000.
- E7. A Multiscale Multiphysics Computational Framework for the Simulation of Blast Induced Pervasive Failure. Sponsor: Defense Threat Reduction Agency. April 2009 – April 2012. PI: G. Cusatis (50%), co-PIs: A. Oberai (Rensselaer), L. Zhang (Rensselaer), J. Bishop (Sandia). \$901,000.
- E6. An Adaptive Multiscale Framework for the Simulation of Fiber-Reinforced High-Performance Concrete Subjected to High Speed Penetration. September 2008 – August 2009. Sponsor: U. S. Army Engineer Research and Development Center (ERDC) - subcontract through Software Systems Solutions, Inc. (ES3). PI : G. Cusatis. \$80,000.
- E5. Microplane Modeling of Size-Effect in Composite Laminates. May 2008 – September 2008. Sponsor: Office of Naval Research - subcontract through Northwestern University. PI: G. Cusatis. \$9,000.
- E4. Microplane Model for Stochastic Heterogeneous Quasi-Brittle Media. May 2008 – September 2008. Sponsor National Science Foundation – subcontract through Northwestern University. PI: G. Cusatis. \$13,000.
- E3. Mesoscale and Macroscale Approaches for the Simulation of Quasi-Brittle Fracture. April 2008 – Aug. 2008. Sponsor: Sandia National Laboratory. PI: G. Cusatis. \$50,000.
- E2. Continuation of the project “Constitutive Modeling and Numerical Algorithms for Concrete Behavior at High Strain Rate”. March. 2007 – Aug. 2007. Sponsor: U. S. Army Engineer Research and Development Center (ERDC) - subcontract through Software Systems Solutions, Inc. (ES3). PI: G. Cusatis. \$29,867.
- E1. Constitutive Modeling and Numerical Algorithms for Concrete Behavior at High Strain Rate. Oct. 2005 – Aug. 2006 (extended to March 2007). Sponsor: U. S. Army Engineer Research and Development Center (ERDC) - subcontract through Software Systems Solutions, Inc. (ES3). PI: G. Cusatis. \$89,995.

### **C. RESEARCH PROJECTS SUPPORTED ON START-UP FUNDS**

- I4. Discrete Cell Method (DCM). Sep. 2007 – Dec. 2009.
- I3. Spectral Particle Method (SPM). Jan. 2006 – Aug. 2007.
- I2. Discrete Particle Model (LDPM) for Concrete. Jan. 2006 – Aug. 2009
- I1. Size Effect and Cohesive Crack Propagation in Quasi-Brittle Materials. Jan. 2006 – Aug. 2008.

### **D. PARTICIPATION IN OTHER RESEARCH PROJECTS**

- O7. Concrete Cracking Simulation at the Early-Ages. Aug. 2005 – Aug. 2006. PI: L. Cedolin (Politecnico di Milano University, Milan, Italy). Sponsor: CIS-E Consortium, Milan, Italy.
- O6. Microplane Model for Composite Laminates. Jun. 2004 – Jun. 2005. PI: Z.P. Bažant (Northwestern University, Evanston, IL). Sponsor: Office of Naval Research.
- O5. Theoretical and Experimental Study of the Behavior of Reinforced-Concrete Structures. Apr. 2002 – Jun. 2004. PI: P. Gambarova (Politecnico di Milano University, Milan, Italy). Sponsor: Italian Minister of University and Research, Rome, Italy.
- O4. Adhesive Fastener Project (I-II-III). Nov. 2001 – Apr. 2003. PI: L. Cedolin (Politecnico di Milano University, Milan, Italy). Sponsor: Hilti Corporation, Schaan, Liechtenstein.
- O3. UE Anchor Project: Anchorages in Normal and High-Performance Concretes Subjected to Medium and High Strain Rates. Mar. 1999 – Mar. 2001. PI: L. Cedolin (Politecnico di Milano University, Milan, Italy). Sponsor: European Union.
- O2. Confinement-Shear Lattice Model for Concrete. Sep. 1998 – Mar. 2002. PI: L. Cedolin (Politecnico di Milano University, Milan, Italy). Sponsor: Italian Minister of University and Research.
- O1. Microprestress-Solidification Theory for Drying and Transitional Thermal Creep. Apr. 1997 – Jul. 1998. PI: L. Cedolin (Politecnico di Milano University, Milan, Italy). Sponsor: Politecnico di Milano.

### **F. SUPPORTED GRADUATE RESEARCH ASSISTANTS**

- Zhou, Xinwei: Fall '09 on project I4.
- Mencarelli, Andrea: Spring '06, and Fall '06 on project E1. Fall '07, Spring '08, and Fall '08 on project I2. Fall '09 on E9.
- Schaufert, Edward: Fall '07 on project I1, Spring '08 on project I4, Fall '08 and Spring '09 on project E6. Fall '09 and Spring '09 on E7.
- Zhou, Miao: Fall '06 and Spring '07 on project I3.

## **VI. PUBLICATIONS**

### **A. BOOKS, MONOGRAPHS, AND BOOK CHAPTERS.**

- B01. Z.P. Bažant and **G. Cusatis**. "Microplane and Lattice/Particle Models for Inelastic Material Behavior". In preparation.

### **B. JOURNAL ARTICLES (PEER REVIEWED)**

- J16. B.W. Foust, J.T. Baylot, D. Pelessone, and **G. Cusatis** "The Effect of Voids on Tensile Strength of Concrete". ACI Materials Journal. 2009, submitted.
- J15. **G. Cusatis**. "High Strain Rate Effects on Concrete Behavior". International Journal of Impact Engineering. 2009, submitted.

- J14. G. Di Luzio and **G. Cusatis**. "Hygro-Thermo-Chemical Modeling of High Performance Concrete. II: Calibration and Validation". *Cement and Concrete Composites*. 2009, 31(5), pp. 309-324.
- J13. G. Di Luzio and **G. Cusatis**. "Hygro-Thermo-Chemical Modeling of High Performance Concrete. I: Theory". *Cement and Concrete Composites*. 2009, 31(5), pp. 301-308.
- J12. **G. Cusatis** and E. A. Schaufert. "Cohesive Crack Analysis of Size Effect". *Engineering Fracture Mechanics*. 2009, 76, pp. 2163-2173.
- J11. L. Cedolin and **G. Cusatis**. "Identification of Concrete Fracture Parameters through Size-Effect Experiments". *Cement and Concrete Composites*. 2008, 30, pp. 788-797.
- J10. L. Cedolin, **G. Cusatis**, S. Eccheli, and M. Roveda. "Capacity of Rectangular Cross Sections Under Biaxial Eccentric Loads", *ACI Structural Journal*, 2008, 105(2), pp. 215-224.
- J09. A. Beghini, **G. Cusatis**, and Z.P. Bažant. "Spectral Stiffness Microplane Model for Quasi-Brittle Composite Laminates: II. Validation and Calibration." *Journal of Applied Mechanics, ASME*, 2008, 75(2), pp. (021009)1-9.
- J08. **G. Cusatis**, A. Beghini, and Z.P. Bažant. "Spectral Stiffness Microplane Model for Quasi-Brittle Composite Laminates: I. Theory." *Journal of Applied Mechanics, ASME*, 2008, 75(2), pp. (021010)1-6.
- J07. L. Cedolin, and **G. Cusatis**. "Cohesive Fracture in Concrete: Theoretical Aspects and Experimental Evidence", *Studies and Researches - Politecnico di Milano*, ed. by A. Migliacci, P.G. Gambarova, and F. Mola, publ. by Starrylink (Brescia, Italy), 2007, Vol. 27, pp. 167-192.
- J06. **G. Cusatis** and L. Cedolin. "Two-scale Analysis of Concrete Fracturing Behavior." Invited paper for the special issue of *Engineering Fracture Mechanics*, 2007, 74(1-2), pp. 3-17.
- J05. L. Cedolin, **G. Cusatis**, S. Eccheli, and M. Roveda. "Biaxial bending of concrete columns: an analytical solution", *Studies and Researches - Politecnico di Milano*, ed. by A. Migliacci, P.G. Gambarova, and F. Mola, publ. by Starrylink (Brescia, Italy), 2006, Vol. 26, pp. 163-192.
- J04. **G. Cusatis**, Z.P. Bažant and L. Cedolin. "Confinement-Shear Lattice CSL Model for Fracture Propagation in Concrete." Invited paper for the special issue of *Computer Methods for Applied Mechanics and Engineering* entitled "Computational Modelling of Concrete", 2006, 195(52), pp. 7154-7171.
- J03. Z.P. Bažant, **G. Cusatis** and L. Cedolin. "Temperature Effect on Concrete Creep Modeled by Microprestess-Solidification Theory." *Journal of Engineering. Mechanics, ASCE*, 2004, 130(06), pp. 691-699.
- J02. **G. Cusatis**, Z.P. Bažant and L. Cedolin. "Confinement-Shear Lattice Model for Concrete Damage in Tension and Compression. II: Numerical implementation and Validation." *Journal of Engineering. Mechanics, ASCE*, 2003, 129(12), pp. 1449-1458.
- J01. **G. Cusatis**, Z.P. Bažant and L. Cedolin. "Confinement-Shear Lattice Model for Concrete Damage in Tension and Compression. I: Theory." *Journal of Engineering. Mechanics, ASCE*, 2003, 129(12), pp. 1439-1448.

#### D. ARTICLES IN CONFERENCE PROCEEDINGS

- C21. Z. P. Bažant, Q. Yu, G.-H. Li, and **G. Cusatis**. "Modeling of Creep and Hygrothermal Deformations of Concrete, and Consequences of Nano-Porosity". Proceedings of the Fourth Biot Conference on Poromechanics. Columbia University, New York City, NY. June 8-10, 2009.

- C20. **G. Cusatis**, A. Mencarelli, D. Pelessone, and J. Bishop. "On the Meso-Scale Simulation of Blast and Penetration Effects on Structures". Electronic Proceedings (CD) of the International Symposium on the Interaction of the Effects of Munitions with Structures (ISIEMS) 13. May 11-15, Bruhel, Germany.
- C19. E. A. Schaufert and **G. Cusatis**. "Cohesive Fracture and the Effective Fracture Process Zone Length". Proceedings of the Inaugural International Conference of the Engineering Mechanics Institute (EM08), University of Minnesota, Minneapolis, Minnesota, May 18-21, 2008.
- C18. **G. Cusatis**, D. Pelessone, and J. T. Baylot. "Dynamic Pull-out Test Simulations Using the Lattice Discrete Particle Model (LDPM)". Proceedings of the 2008 ASCE Structures Congress, April 24-26, 2008, Vancouver, Canada.
- C17. **G. Cusatis**, A. Mencarelli, D. Pelessone, and J. T. Baylot. "Lattice Discrete Particle Model (LDPM) for Fracture Dynamics and Rate Effect in Concrete". Proceedings of the 2008 ASCE Structures Congress, April 24-26, 2008, Vancouver, Canada.
- C16. **G. Cusatis**, D. Pelessone, A. Mencarelli, and J. T. Baylot. "Simulation of Reinforced Concrete Structures Under Blast And Penetration Through Lattice Discrete Particle Modeling". Electronic Proceedings (CD) of IMECE 2007 - ASME International Mechanical Engineering Conferences & Exposition, November 11-15, 2007, Seattle, USA.
- C15. D. Pelessone, **G. Cusatis**, and J. T. Baylot. "Application of the Lattice Discrete Particle Model (LDPM) to Simulate the Effects of Munitions on Reinforced Concrete Structures". Electronic Proceedings (CD) of the International Symposium on the Interaction of the Effects of Munitions with Structures (ISIEMS) 12.1, September 17-21, 2007, Orlando, FL, USA.
- C14. **G. Cusatis**, A. Mencarelli, D. Pelessone, and J. T. Baylot. "Lattice Discrete Particle Model (LDPM): Formulation, Calibration, and Validation". Electronic Proceedings (CD) of the International Symposium on the Interaction of the Effects of Munitions with Structures (ISIEMS) 12.1, September 17-21, 2007, Orlando, FL, USA.
- C13. L. Cedolin and **G. Cusatis**. "Cohesive fracture and size effect in concrete". Fracture Mechanics of Concrete and Concrete Structures. Volume 1: New Trends in Fracture Mechanics of Concrete (Proceedings of the Sixth International Conference on Fracture Mechanics of Concrete and Concrete Structures – FraMCoS-6). Catania, Italy. June 18-21, 2007. ISBN 978-0-415-44065-3. pp. 17-29.
- C12. **G. Cusatis** and Z.P. Bažant. "Size effect on compression fracture of concrete with or without V-notches: a numerical meso-mechanical study". Proceedings of the EURO-C 2006 Conference on Computational Modelling of Concrete Structures, 27-30 March 2006, Mayrhofen, Tyrol, Austria. ISBN 10: 0 415 39749 9. pp. 71-76.
- C11. P. Grassl, Z.P. Bažant, and **G. Cusatis**. "Lattice-cell approach for modeling fracture". Proceedings of the EURO-C 2006 Conference on Computational Modelling of Concrete Structures, 27-30 March 2006, Mayrhofen, Tyrol, Austria. ISBN 10: 0 415 39749 9. pp. 263-268.
- C10. **G. Cusatis** and D. Pelessone "Mesolevel simulation of reinforced concrete structures under impact loadings". Proceedings of the EURO-C 2006 Conference on Computational Modelling of Concrete Structures, 27-30 March 2006, Mayrhofen, Tyrol, Austria. ISBN 10: 0 415 39749 9. pp. 63-70.
- C09. L. Cedolin, **G. Cusatis**, S. Eccheli, and M. Roveda. "On the failure envelope of reinforced concrete cross sections subjected to biaxial bending and axial load: an analytical solution". Electronic Proceedings (CD) of the Second FIB Congress, 5-8 June 2006, Naples, Italy.

- C08. Z.P. Bažant, and **G. Cusatis**. “Concrete creep at high temperature and its interaction with fracture: recent progress” Creep, shrinkage and durability of concrete and concrete structures. (Proceedings of the 7th International Conference CONCREEP-7, Nantes, France, 12-14 September 2005., Pijaudier-Cabot Gilles, Gérard Bruno, and Acker Paul eds., pp. 449-459.
- C07. Z.P. Bažant, and **G. Cusatis**. “Creep diffusion and fracture in heated concrete structures: recent progress” Proceedings of the 6th International Congress on Thermal Stresses. 26-29 May 2005, Vienna, Austria. F. Ziegler, R. Heuer, C. Adam, eds, Vienna University of Technology, Austria, pp. 15-22.
- C06. **G. Cusatis**, M. Polli and L. Cedolin. “Mesolevel analysis of fracture tests for concrete.” Fracture Mechanics of Concrete Structures (Proceedings of the Fifth International Conference on Fracture Mechanics of Concrete and Concrete Structures – FraMCoS-5). Vail Cascade Resort, Vail Colorado, USA. V.C. Li, C.K.Y. Leung, K.J. Willam, S.L. Billington, ed., la-FraMCoS, USA, April 2004. ISBN 0-87031-135-2, pp. 345-351.
- C05. Z.P. Bažant, F.C. Caner, L. Cedolin, **G. Cusatis** and G. Di Luzio. “Fracturing Material Models Based on Micromechanical Concepts: Recent Advances.” Fracture Mechanics of Concrete Structures (Proceedings of the Fifth International Conference on Fracture Mechanics of Concrete and Concrete Structures – FraMCoS-5). Vail Cascade Resort, Vail Colorado, USA, April 2004. V.C. Li, C.K.Y. Leung, K.J. Willam, S.L. Billington, ed., la-FraMCoS, USA, ISBN 0-87031-135-2, pp. 83-89.
- C04. G. Di Luzio and **G. Cusatis**. “A New Constitutive Model for Concrete-Steel Bond Behavior.” Computational Modeling of Concrete Structures (Proceedings of the EURO-C 2003 Conference). St. Johann im Pongau, Austria, March, 2003. N. Bićanić, R. de Borst, H. Mang, G. Meschke, ed., A.A. Balkema, The Netherlands, ISBN 9058095363, pp. 281-286.
- C03. **G. Cusatis**, G. Di Luzio and M. Rota. “Simulation of Headed Anchor Failure.” Computational Modeling of Concrete Structures (Proceedings of the EURO-C 2003 Conference). St. Johann im Pongau, Austria, March 2003. N. Bićanić, R. de Borst, H. Mang, G. Meschke, ed., A.A. Balkema, The Netherlands, ISBN 9058095363, pp. 683-688.
- C02 **G. Cusatis**, Z.P. Bažant and L. Cedolin. “3D Lattice model for dynamic simulations of creep, fracturing and rate effect in concrete.” Creep, shrinkage and durability mechanics of concrete and other quasi-brittle materials. (Proceedings of the 6th International Conference CONCREEP-6, MIT, Cambridge (MA), USA, August 2001. F.-J. Ulm, Z.P. Bažant and F.H. Wittmann, eds., Elsevier, Amsterdam, ISBN 0080440029, pp. 113-118.
- C01. Z.P. Bažant, L. Cedolin and **G. Cusatis**. “Temperature effect on concrete creep modeled by Microprestress-Solidification theory.” Creep, shrinkage and durability mechanics of concrete and other quasi-brittle materials. (Proceedings of the 6th International Conference CONCREEP-6, MIT, Cambridge (MA), USA, August 2001. F.-J. Ulm, Z.P. Bažant and F.H. Wittmann, ed., Elsevier, Amsterdam, ISBN 0080440029, pp. 197-204.

#### **E. RESEARCH AND TECHNICAL REPORTS**

- R5. ACI 446 Members, “Computational Analysis of Fracture in Concrete Structures”, ACI Report 446.3R-97 (revision 2009).
- R4. Bažant Z.P., Beghini A., **Cusatis G.**, Zhou Y., and Daniel I.M. “Advances in Modeling of Fracture, Damage and Scale Effects in Fiber Composites and Sandwich Structures”. Final Report. ONR-Grant N00014-02-1-0622. March 2005. Department of Civil and Environmental Engineering, Northwestern University, Evanston (IL), USA.

- R3. **G. Cusatis**, Z.P. Bažant and L. Cedolin. “Confinement –Shear Lattice Model for Concrete Damage in Tension and Compression.” Report No. 02-8/C699c, August 2002. Department of Civil and Environmental Engineering, Northwestern University, Evanston (IL), USA.
- R2. L. Cedolin, G. Di Luzio, **G. Cusatis**, and M. Rota. “Adhesive Fastener Project – Final Report”, HILTI Corporation Project, June 2002. Department of Structural Engineering, Politecnico di Milano University, Milan, Italy.
- R1. L. Cedolin, P. Bianchi, **G. Cusatis**, G. Di Luzio and A. Ratti. “Anchorage in normal and high performance concretes subjected to medium and high strain rates – Final Report”, UE ANCHOR Project, March 2001. Department of Structural Engineering, Politecnico di Milano University, Milan, Italy.

## **VII. EDITORSHIP OF JOURNALS, REVIEW OF MANUSCRIPTS, BOOKS, AND RESEARCH PROPOSALS**

### **A. MANUSCRIPT REVIEWS**

ACI Material Journal  
 ACI Structural Journal  
 ASCE Journal of Structural Engineering  
 ASCE Journal of Architectural Engineering  
 ASCE Journal of Materials in Civil Engineering  
 Cement and Concrete Composites Journal  
 Computers and Concrete  
 Computer Methods in Applied Mechanics and Engineering  
 Computer and Structures  
 Engineering and Computational Mechanics  
 Engineering Fracture Mechanics  
 Engineering Structures  
 European Journal of Mechanics  
 Experimental Mechanics  
 Fatigue and Fracture of Engineering Materials and Structures  
 International Journal of Solids and Structures  
 International Journal for Numerical Methods in Engineering  
 International Journal of Fracture  
 Journal of Materials Science  
 Journal of Materials in Civil Engineering  
 Journal of Mechanics of Materials and Structures  
 Journal of Zhejiang University-SCIENCE A  
 Materials and Structures

### **B. PROPOSAL REVIEWS**

Army Research Office  
 Defense Threat Reduction Agency  
 Louisiana Board of Regents  
 National Science Foundation  
 Transportation Northwest (University of Washington)

## **VIII. SERVICE**

### **A. SERVICE TO UNIVERSITY**

#### ***University, School, and Departmental Committees***

- 175<sup>th</sup> Anniversary Celebration Committee, Member, Sep. 2009 – Present.

- Departmental Graduate Committee, Member, Sep. 2008 – Present.
- Faculty Peer Support Committee, Member, Sep. 2008 – Sep. 2009.
- Faculty Mentorship Committee, Chair, Jan. 2008 – Sep. 2008.
- Departmental Undergraduate Committee, Member, Jan. 2008 – Sept. 2008.
- Ph.D. Committee of Andrea Mencarelli, Chair, Rensselaer, Oct. 2008 - Present.
- Ph.D. Committee of Jayesh Shinde, Member, Rensselaer, Sep. 2008 - Present.
- Ph.D. Committee of Xiaojian (Jerry) Xie, Member, Rensselaer, Sep. 2006 – Dec. 2008.

#### ***Other Service and Administration Activities***

- Advisor for the RPI Steel Bridge Club, Fall 2006 – Present.
- FE Exam review sessions for Structural Engineering, Spring 2006, 2007, 2008.
- Summer Orientation Session, 2007, 2009.

#### ***Undergraduate Student Advising and Counseling***

- Academic advisor for 31 junior undergraduate students, Rensselaer, AA 2009-2010.
- Academic advisor for 36 sophomore undergraduate students, Rensselaer, AA 2008-2009.
- Academic advisor for 30 freshman undergraduate students, Rensselaer, AA 2007-2008.

#### ***Graduate Student Advising and Counseling***

- Academic advisor for 25 co-terminal degree students, Rensselaer, AA 2009-2010
- Academic advisor for 4 graduate students, Rensselaer, AA 2009-2010
- Academic advisor for 4 graduate students, Rensselaer, AA 2008-2009
- Academic advisor for 2 graduate students, Rensselaer, AA 2007-2008
- Academic advisor for 3 graduate students, Rensselaer, AA 2006-2007
- Academic advisor for 2 graduate students, Rensselaer, AA 2005-2006

#### **B. PROFESSIONAL SOCIETIES**

- United States Association for Computational Mechanics (USACM), Member, August 2009 – Present
- American Society of Civil Engineering (ASCE), Member, August 2006 – Present
- American Concrete Institute (ACI), Member, August 2005 – Present
- The Milan Order of Engineers, Member, 1999 – 2006

#### **C. TECHNICAL COMMITTEES AND TECHNICAL BOARDS**

- IA-CONCREEP, Board of Directors, Secretary, October 2008 – Present.
- ASCE Engineering Mechanics Institute – Computational Mechanics, Member, April 2008 – Present.
- ASCE Engineering Mechanics Institute – Modeling Inelasticity and Multi-Scale Behavior, May 2008 – Present.
- ACI 209, Creep and Shrinkage in Concrete, May 2008 – Present.
- ACI 446 Fracture Mechanics, Member, September 2005 – Present.
- ACI 447 Finite Element Analysis of Reinforced Concrete Structures (Joint ACI-ASCE), Member, April 2008 – Present.

#### **D. CHAIRMANSHIPS AT CONFERENCES AND WORKSHOPS**

- 10th U.S. National Congress for Computational Mechanics, Mini-symposium on Structural Response Under Extreme Loads: Modeling, Simulation, and Experiments, Columbus (OH), July 16-19, 2009, Session Organizer and Session Chairman.
- The 2009 Joint ASCE-ASME-SES Conference on Mechanics and Materials, Symposium in Honor of Z. P. Bažant, Blacksburg (VA), June 24-27, 2009, Session Chairman.
- Mini-symposium on Failure Simulation by Discrete Models, CFRAC 2007, International Conference on Computational Fracture and Failure of Materials and Structures, Nantes, France, June 11 – 13, 2007, Session Chairman.

## **IX. PROFESSIONAL AND PUBLIC LECTURES**

### **A. SHORT COURSES**

2. (May 2007) “Design of Prestressed Concrete Bridges”. NYDOT Training Course. Rensselaer Polytechnic Institute, Troy (NY), USA.
1. (Apr. 2007) “Modeling and Analysis of the Response of Structures (MARS) Workshop: the Lattice Discrete Particle Model (LDPM)”. U.S. Army Engineer Research & Development Center, Vicksburg (MS), USA.

### **B. INVITED LECTURES**

19. (Sep. 2009) “The Lattice Discrete Particle Model (LDPM) for the Simulation of Concrete under Extreme Loading Events. Current Status and Future Outlook”, Sandia National Laboratories. Albuquerque (NM), USA.
18. (Mar. 2009) “Modeling Concrete Failure Behavior under Quasi-Static and Dynamic Loading Conditions: A Discrete Mesoscale Approach”, Cornell University, Ithaca (NY), USA.
17. (Dec. 2008) “Microplane and Discrete Modeling of Quasi-Brittle Materials”, Politecnico di Milano, Milan, Italy.
16. (Dec. 2008) “Mesoscale Discrete Modeling of Fracture and Fragmentation for the Simulation of Concrete Structures Subjected to Extreme Loading Conditions”, University of Bologna, Bologna, Italy.
15. (Oct. 2008) “Discrete Modeling of Quasi-Brittle Fracture and Fragmentation: Recent Advances”. Warren Lecture Series, University of Minnesota, Minneapolis (MN), USA.
14. (May 2008) “Meso-Scale Discrete Modeling of Reinforced Concrete Structures Subjected to Penetration: Recent Advances”. Materials under Extreme Loadings – Application to Penetration and Impact. The second US-France conference organized by the International Center for Applied Computational Mechanics. Rocamadour, France – May 28-30, 2008.
13. (May 2008) “Ten Years of Discrete Modeling of Concrete Behavior: Achievements and Future Challenges”. Politecnico di Milano, Milan, Italy.
12. (Mar. 2008) “Discrete Modeling of Fracture and Fragmentation of Concrete Subjected to Impact and Penetration”. Penn State University, State College (PA), USA.
11. (Mar. 2008) “Discrete Modeling of Quasi-Brittle Fracture and Fragmentation: Current Trends and Future Outlook”. Theoretical and Applied Mechanics Colloquia, Northwestern University, Evanston (IL), USA.
10. (Jun. 2007) “Discrete Models for the Simulation of Concrete Behavior”. ZPB70Workshop, Prague, Czech Republic.
09. (Jun. 2007) “Lattice Discrete Particle Model (LDPM) for the Simulation of Reinforced Concrete Structures under High-Impulsive Loadings.” International Conference on Computational Fracture and Failure of Materials and Structures, Nantes, France.

08. (Mar. 2007) "Lattice Discrete Particle Model (LDPM) for the Simulation of Reinforced Concrete Structures under Extreme Loading Conditions." Institute for Advanced Technology, University of Texas at Austin, Austin (TX), USA.
07. (Jul. 2006) "Mesolevel Modeling of Concrete Structures Subjected to Extreme Loading Conditions." Northwestern University. Evanston (IL), USA.
06. (Jun. 2006) "A Framework for the Analysis of Transverse Cracking in Composite Bridges." New York Department of Transportation. Albany (NY), USA.
05. (Mar. 2006) "Mesolevel Modeling of Concrete and Applications." University of California at Davis. Davis (CA), USA.
04. (Dec. 2005) "A Computational Framework for Quasi-Brittle Fracture and Fragmentation of Concrete Structures." Sandia National Laboratories. Albuquerque (NM), USA.
03. (Apr. 2004) "Explicit interface constitutive model with application to mesolevel analysis of concrete fracture." FraMCos-5 2004, Fifth International Conference on Fracture Mechanics of Concrete and Concrete Structures Workshop 2: Interface Modelling. Vail Cascade Resort, Vail (CO), USA.
02. (Feb. 2004) "Mesostructural analysis of the fracturing behavior of quasi-brittle materials." Department of Civil Engineering. University of Brescia, Brescia, Via Branze, 38 – 25123 Brescia, Italy.
01. (Apr. 2003) "Shear-confinement lattice model: a new mesolevel constitutive law for Concrete." Department of Geomaterials, Barcelona Politechnique (UPC). Barcelona, Spain.

**C. RESEARCH PRESENTATIONS AT INTERNATIONAL CONFERENCES, SYMPOSIUMS, AND WORKSHOPS**

9. (May 2009) "On the Meso-Scale Simulation of Blast and Penetration Effects on Structures". International Symposium on the Interaction of the Effects of Munitions with Structures (ISIEMS) 13. Bruhel, Germany.
8. (Jan. 2009) "Meso-Scale Discrete Modeling of Concrete: Recent Advances", Plasticity 2009, St. Thomas, Virgin Islands, USA.
7. (Sep. 2007) "Lattice Discrete Particle Model (LDPM): Formulation, Calibration, and Validation". International Symposium on the Interaction of the Effects of Munitions with Structures (ISIEMS) 12.1, Orlando (FL) USA.
6. (June 2007) "Microplane Model for Composite Laminates", International Conference on Modelling of Heterogeneous Materials with Applications in Construction and Biomedical Engineering, Prague, Czech Republic.
5. (Mar. 2006) "Size effect on compression fracture of concrete with or without V-notches: a numerical meso-mechanical study". Conference on Computational Modelling of Concrete Structures, Mayrhofen, Tyrol, Austria.
4. (Mar, 2006) "Mesolevel simulation of reinforced concrete structures under impact loadings". Conference on Computational Modelling of Concrete Structures, Mayrhofen, Tyrol, Austria.
3. (Apr. 2004) "Mesolevel analysis of fracture tests for concrete." Fifth International Conference on Fracture Mechanics of Concrete and Concrete Structures – FraMCoS-5. Vail Cascade Resort, Vail (CO) USA.
2. (Mar. 2003) "Simulation of Headed Anchor Failure." Computational Modeling of Concrete Structures, EURO-C 2003 Conference. St. Johann im Pongau, Austria.
1. (Aug. 2001) "3D Lattice model for dynamic simulations of creep, fracturing and rate effect in concrete." 6th International Conference CONCREEP-6, MIT, Cambridge (MA), USA.

**D. RESEARCH PRESENTATIONS AT NATIONAL CONFERENCES, SYMPOSIUMS, AND WORKSHOPS**

6. (Sep. 2009) "The Lattice Discrete Particle Model (LDPM): Achievements and Current Research Thrusts", Multiscale Science and Engineering Center (MSEC) Seminar Series, Rensselaer Polytechnic Institute, Troy (NY).
5. (Jul. 2009) "Penetration of Reinforced Concrete Structures: a Meso-Scale Approach". 10th U.S. National Congress for Computational Mechanics, July 16-19, 2009, Columbus (OH)
4. (Jun. 2009) "Numerical Simulation of Blast and Penetration Effects on Structures". The 2009 Joint ASCE-ASME-SES Conference on Mechanics and Materials Symposium in Honor of Z. P. Bažant, June 24-27, 2009, Blacksburg (VA).
3. (Apr. 2008) "Lattice Discrete Particle Model (LDPM) for Fracture Dynamics and Rate Effect in Concrete". 2008 ASCE Structures Congress, April 24-26, 2008, Vancouver, Canada.
2. (Nov. 2006) "Two-scale Study of Concrete Fracturing Behavior", Multiscale Science and Engineering Center (MSEC) kick-off workshop, Rensselaer Polytechnic Institute, Troy (NY).
1. (Jan. 2006) "Mesolevel Simulation of Reinforced Concrete Structures Under Impact Loadings". Advances in Computational Penetration Mechanics Workshop, U.S. Army Engineer Research & Development Center, Vicksburg (MS).

#### **E. RESEARCH PRESENTATIONS AT SPONSORED PROJECT PROGRESS MEETINGS**

5. (Jul. 2009) "A Multiscale Multiphysics Computational Framework for the Simulation of Blast Induced Pervasive Failure", HDTRA1-09-1-0029 Project kick-off meeting, Rensselaer Polytechnic Institute, Troy (NY).
4. (Jun. 2009) "Lattice Discrete Particle Model for Fiber Reinforced Concrete (LDPM-F): Current Status". U.S. Army Engineer Research and Development Center, Vicksburg (MS), USA.
3. (Jun. 2009) "The Lattice Discrete Particle Model (LDPM) for Damage, Fracture, and Fragmentation of Concrete". U.S. Army Engineer Research and Development Center, Vicksburg (MS), USA.
2. (Oct. 2006) "Lattice Discrete Particle Model (LDPM): Verification, Calibration & Validation". U.S. Army Engineer Research and Development Center, Vicksburg (MS), USA.
1. (Jan. 2006) "Formulation of Concrete Constitutive Law at the Mesolevel". U.S. Army Engineer Research and Development Center, Vicksburg (MS), USA.

#### **X. ATTENDANCE AT RESEARCH AND EDUCATION WORKSHOPS/MEETINGS**

4. (April 27 – April 28, 2008) "NSF CAREER Workshop". Northwestern University, Evanston, IL, USA.
3. (July 25 – July 30, 2007) "2007 ASCE ExCEEEd Teaching Workshop". United States Military Academy, West Point, NY, USA.
2. (July 31 – August 2, 2006) "Engineering and Economics of Reinforced Concrete Buildings Workshop". Portland Cement Association, Skokie, IL, USA.
1. (August 3 – 4, 2006) "Design of Concrete Bridges by the AASHTO LRFD Specifications Seminar Workshop". Portland Cement Association, Skokie, IL, USA.