# Oral Buyukozturk, Ph.D.

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Photo Courtesy David Sella (ILP)

## ✓ BIOSKETCH

Dr. Oral Buyukozturk is George Macomber Professor, Professor of Civil and Environmental Engineering, and Director of the Laboratory for Infrastructure Science and Sustainability at the Massachusetts Institute of Technology (MIT). He received his Ph.D. degree in Structural Engineering from Cornell University in 1970. He joined the MIT faculty in 1976 following six years of experience, including two years at United Engineers and Constructors in safety analysis and design of nuclear containment structures, and four years as Senior Research Scientist with Marc Analysis and Research Corporation (Brown University affiliate) and as Adjunct Associate Professor at Brown University in computational engineering analysis and development. Professor Buyukozturk's research interest is in infrastructure mechanics, materials, and sustainability integrating areas of multiscale concrete and interface mechanics for durable and sustainable structures, and innovative sensing and data analytics towards the development of intelligent structures and resilient cities. His work in these areas have led to groundbreaking developments and innovations in multiscale modeling and design of cementitious materials with additives, use of locally available waste materials (e.g., irradiated post-consumed plastic, volcanic ash) for durable and sustainable concrete materials and construction, and in novel computer vision techniques for structural sensing with motion magnification, system identification and structural health monitoring.

His earlier work at MIT includes fundamental research and development in thermomechanical analysis of coal gasification vessels, as well as his pioneering contribution in the evolution of segmental prestressed bridge design and construction technology. He has conducted seminal research in interface fracture mechanics, innovative experimentation for interface assessment in multi-material systems, and fiber reinforced plastic (FRP) composites for structural rehabilitation. His early work at Marc Analysis/Brown University involved pioneering developments in concrete constitutive relations, and finite element analysis of complex structures with nonlinearities and progressive cracking. Computational concrete material models he developed are still in use today by major commercial general-purpose finite element programs. It is worth noting that his current pioneering work on computational multiscale concrete using molecular dynamics provides a fundamental basis for his earlier developments of phenomenological models of complex concrete behavior.

Professor Buyukozturk's research represents an integrated development towards infrastructure sustainability through a bottom-up approach contributing to establishment of a new paradigm in infrastructure engineering. He has published over 350 technical papers in refereed journals and proceedings. He edited/co-edited and contributed to nearly 20 books and published over 100 formal technical reports. He has made more than 220 invited and keynote presentations around the world and served in different capacities in numerous technical committees of professional societies. His work has been recognized through multiple prestigious honors and awards including the *George W. Housner Structural Control and Monitoring Medal* from the American Society of Civil Engineers (ASCE); the *Golden Mirko Roš Medal* of EMPA the Swiss Federal Research Laboratory for Materials Science and Technology; *Fellow (non-resident) of the Royal Society of Edinburgh*, Scotland's National Academy of Science and Letters; the *Distinguished Service and Leadership Award* from the Civil and Environmental Engineering Department at MIT; *Fellow of American*

*Concrete Institute (ACI); Fellow of American Society of Civil Engineers (ASCE); ASNT* (American Society of Nondestructive Testing) *National Faculty Fellowship Awards (*2008 & 2011); and various best paper awards with his students. He recently received *H. Adeli Award for Innovation in Computing* (2021), and recognized in 2021 Mendeley metadata of citations by Elsevier as "in the top 0.1% cited scientists" among a subgroup of 32,178 select top scientists world-wide within the Acoustic Field of Science and Engineering; his research work in the Acoustics field includes wave propagation in nondestructive evaluation and sensing of physical infrastructure .

## ✓ EDUCATION

Ph.D. - Cornell University 1970
M.S. - Cornell University 1969
M.S.C.E. - Istanbul Technical University

## ✓ PROFESSIONAL EXPERIENCE

1985 – **Professor**, Department of Civil and Environmental Engineering, MIT, Cambridge, MA

1980 – 1985 **Associate Professor with tenure**, Department of Civil and Environmental Engineering, MIT, Cambridge, MA

1976 – 1980 **Associate Professor without tenure**, Department of Civil and Environmental Engineering, MIT, Cambridge, MA

2006 – 2006 **Visiting Professor**, Istanbul Technical University, Istanbul, Turkey

2006 – 2006 **Visiting Professor**, Kultur University, Istanbul, Turkey

1999 – 1999 **Visiting Professor**, National University of Singapore, Singapore

1998 - 2000 **Visiting Professor**, Bogazici University, Istanbul, Turkey

1991 – 1991 **Visiting Professor**, ETH, Zurich, Switzerland

1985 – 1985 **Visiting Professor**, Technical University of Berlin, Berlin, Germany

1983 – 1983 **Visiting Professor**, Istanbul Technical University, Istanbul, Turkey

1973 – 1974 **Adjunct Associate Professor of Engineering**, Brown University, Providence, RI

1972 – 1976 **Senior Research Engineer,** Marc Analysis Research Corporation, Providence, RI

1970 – 1972 **Research Engineer/Consultant**, United Engineers and Constructers, Philadelphia, PA

1967 – 1970 **Research Assistant**, Department of Structural Engineering, Cornell University, Ithaca, NY

## ✓ RESEARCH INTERESTS

Professor Oral Buyukozturk is recognized as a world leader in the fields of *infrastructure mechanics*, *materials*, and *sustainability*. He has made seminal contributions to these fields towards realizing quantitative resiliency, sustainability, and intelligence of the built environment. He has advanced the boundaries of knowledge and brought many young learners and researchers along with him in his discoveries. His work has led to fundamental and ground-breaking innovations and substantially enhanced research, practice, and the engineering literature. His research impacts are highlighted below:

- Multiscale concrete mechanics and computational modeling from atomistic to macroscale

- Interface mechanics and experimentation in multi-material systems
- Sustainable and durable cementitious materials using locally available and waste materials
- Fracture and durability of FRP (Fiber Reinforced Polymer) retrofitted concrete systems
- Thermomechanical behavior of high temperature refractory linings
- Energy-based seismic design of structures
- Novel sensing, motion magnification and deep learning for vision-based infrastructure monitoring

His work and innovations in engineering mechanics have evolved in an integrative fashion towards infrastructure resiliency and sustainability.

An example of Professor Buyukozturk's transformative research in manufacturing sustainable and durable cementitious materials is a recent breakthrough concept proposed by him and his team involving the discovery of molecular modification of plastic surfaces through irradiation of post-consumer plastic for better molecular bonding between the plastic and the hydration products of concrete. He and his team innovated the use of irradiated plastic as a cement displacer, or an additive, in manufacturing durable and strong concrete to achieve (a) reduction of carbon emission by replacing part of the cement with irradiated waste plastic, (b) an environmentally safe storage of plastic waste as a solution to a critical world problem, and (c) to produce a concrete quality equal to or better than the corresponding control specimen without any additives. This discovery with potential for a revolutionary paradigm has created a worldwide interest, and follow-up construction engineering initiatives. A start-up was created for implementing this concept in scalable applications. A recent paper by Pierre-Edouard Denis, Kaveh Bakhtari, Emmanuel Chatoux, Alexandre Chaizemartin, Clement Uhring, Lionel Linger, and Oral Buyukozturk on "Use of modified waste plastic as cement replacement in concrete-A case study of the Tideway Project" in FIB International Conference Proceedings, Oslo Norway June 2022, describes the use of the new material in a major infrastructure project in London, involving major construction companies *Costain / VINCI Construction Grands Projects / Bachy Soletanche Joint-Venture.*

## ✓ HONORS AND AWARDS

2021 The **Hojjat Adeli Award for Innovation in Computing** in 2021

2021 Recognized as **"in the top 0.1% cited scientists"** among a subgroup of 32,178 select top scientists world-wide within the Acoustic Field of Science and Engineering.

2020 **Fellow ASCE** (American Society of Civil Engineers)

2019 Recipient of the **George Macomber Professorship, MIT Endowed Chair**

2018 **Distinguished Service and Leadership Award** from MIT Department of Civil and Environmental Engineering, to "*Recognize outstanding departmental service and leadership contributions of a member of the CEE faculty, to acknowledge colleagues who foster a culture of diversity, inclusiveness, and innovation, to further the department mission and vision and MIT as a whole.*"

2018 **George W. Housner Structural Control and Monitoring Medal** from the American Society of Civil Engineers, for "*Pioneering and transformative developments in video-based structural sensing and identification, interferometry-based data analytics, high-efficiency generic wireless networks, and their integration with groundbreaking engineering mechanics research and practice for enhancing civil infrastructural resilience and sustainability.*"

2011 **Golden Mirko Ros Medal** from EMPA Swiss Federal Laboratories for Materials Science and Technology, for "*Most valuable and sustained contribution to materials science and engineering in*

*the domain of civil engineering and also for his outstanding research support to EMPA over the past two decades.*"

2009 **Fellow of Royal Society of Edinburgh**, Scotland's, National Academy of Science and Letters, for "*Transformative contributions to computational analysis, engineering and design.*"

1990 Fellow, American Concrete Institute (ACI)

1992 American Railway Engineering Association National Award for work on "Rail Bridge Fatigue"

1993 ACI Research and Education Award for work on "Fiber Reinforced High Strength Concrete",

1994 SEM Best Paper prize

1996 Swiss Board Appointed Member, International Panel to evaluate research and teaching of (ETH, EPFL, EMPA), Swiss Federal Institutions

2002 Listed in Who's Who in Engineering Education (WWEE)

2006 ASCE Best Basic Research Paper Award

2008 American Society of Nondestructive Testing (ASNT) Faculty Fellowship Award

2011 American Society of Nondestructive Testing (ASNT) Faculty Fellowship Award

2014 Recognition as Top Author, Elsevier Construction and Building Materials

***Awards with Students and Postdoc***

1995 Goody Prize for work on "Bridge Instrumentation" (G. Grippo, graduate student)

1990 Goody Prize (C. Schwitter, student)

2007 Goody Prize (Denvid Lau, Graduate Student)

2015 MIT Distinguished Freshman Award for Research (Cheahuychou Mao, Undergraduate Student)

2016 MIT Distinguished Freshman Award for Research (Stephanie Chin, Undergraduate Student)

2016 MIT CEE Innovation@One Business Pitch Champion First Place (Justin Chen, Graduate Student)

2016 3rd Annual MIT CEE Video Competition, People's Choice Award (Justin Chen, Graduate Student)

2017 EMI Best Paper Award (Murat Uzun, Graduate Student)

2017 EMI Best Paper Award (Reza Mohammadi-Ghazi, Graduate Student)

2017 The Most Practical SHM Solution for Civil Infrastructures Award, $1000 Prize, to Abe Davis and Justin Chen (Graduate student) for the SHM in Action demonstration at IWSHM 2017

2018 Forbes' 30 Under 30: Science (Postdoc Hao Sun)

2021 The Hojjat Adeli Award for Innovation in Computing (Jointly awarded with James Long, graduate Student)

✓ **SELECTED GRANTS AND CONTRACTS AS PI**

Data Interferometry for Field Monitoring: Development and Applications in Structural and Crustal Systems (2018-2020), Oral Buyukozturk (PI) and Nafi Toksoz (Co-PI), Shell Global, $1,310,000.00

Multi-scale Characterization of Oil-well cements for Water Dynamics and Microstructure Analysis (2017-2019), Oral Buyukozturk (PI), Aramco Services Company, $400,000.

MIT-Kuwait Signature Project: Sustainability of Kuwait's Built Environment (2013-2017), Oral Buyukozturk (PI), Kuwait Foundation for the Advancement of Sciences, $4,970,000.00

Motion Sensing Wi-FI Sensor Networks, Continuous 3D Modeling and Prediction of Facility Responses to Disturbances (2011-2017), Oral Buyukozturk (PI) William Freeman (Co-PI), MIT Energy Initiative, Shell International Exploration & Production, Inc., $8,000,000.00

Energy-Based Structural Analysis of Single Degree of Freedom Systems Using Shake Table Experiments (2017-2018); MISTI, Oral Buyukozturk (PI), $29,000.00

Seismic Surveying with Laser Doppler Vibrometry (LDV) (2016-2017), MIT Energy Initiative, Shell International Exploration & Production, Inc., Oral Buyukozturk (PI), $125,000.00

Development and Performance Assessment of Oil Well Cements prepared with Saudi Arabian Volcanic Ash: Durability and Sustainability (2017–2018), Oral Buyukozturk (PI), Saudi Aramco, Saudi Arabia, $150,000.00

Energy Fellow – Justin Chen (2015-2017), Oral Buyukozturk (PI), MIT Energy Initiative, Shell International Exploration & Production, Inc., $120,000.00

In-situ Damage Assessment of Cultural Heritage through Chemical Imaging and Motion Magnification (2016 - 2017), CEE Cross-Disciplinary Seed Fund Proposal, Approved 1 academic year, Co-PI's Oral Buyukozturk and Admir Masic, $70,000.00

Shell (MITEI) Energy Fellow – Justin Chen (2012-2013), MIT Energy Initiative, Shell International Exploration & Production, Inc., $59,999.96

Remote Detection of Damage in FRP-Retrofitted Concrete Structures using Acoustic-Laser Vibrometry (2011-2013), The American Society for Nondestructive Testing, Oral Buyukozturk (PI), $14,993.06

Mentoring Kuwaiti Scholar (2010-2013), Kuwait Foundation for the Advancement of Sciences, Oral Buyukozturk (PI), $5,000.00

A Robust Methodology for the Standoff Condition Assessment of FRP-Retrofitted Concrete Systems (2009-2013), NSF, Oral Buyukozturk (PI), $254,999.0

De-Bonding in Bi-layer Material Systems under Moisture Effects: A Multi-Scale Fracture Approach (2009-2013), NSF, Oral Buyukozturk (PI), $353,728.22

Travel Support for the U.S. Participants to Attend an International Workshop on Prevention of Total Collapse of Existing Structures (2007-2008), NSF, Oral Buyukozturk (PI), $12,558.55

Moisture Affected De-Bonding in FRP Retrofitted Concrete Systems – An Interface Fracture Approach (2005-2009), NSF, Oral Buyukozturk (PI), $262,560.35

ACC Funding for Non-Destructive Evaluation of FRP-confined Concrete using Microwave (2004-2005), Lincoln Laboratory, Oral Buyukozturk (PI), $50,000.00

ACC Funding for Non-Destructive Evaluation of FRP-confined Concrete using Microwave (2004-2006), Lincoln Laboratory, Oral Buyukozturk (PI), $50,000.00

Nondestructive Evaluation of FRP-Confined Concrete Using Microwave (2003-2008), NSF, Oral Buyukozturk (PI), $300,308.00

A Novel Approach to Nondestructive Evaluation of FRP-Confined Concrete using Microwaves (2002-2003), NSF, Oral Buyukozturk (PI), $99,314.15

Use of Advanced Composites in Maglev Guideway Systems, Center for Transportation and Logistics (2002-2003), U.S. Department of Transportation TSC, Oral Buyukozturk (PI), $60,000.00

Failure Behavior of FRP Bonded Concrete Affected by Interface Fracture (2001-2005), NSF, Oral Buyukozturk (PI), $250366.00

Monitoring Fatigue Crack Growth in Steel Bridges Using Acoustic Emission (AE) Technique (2/1/2001 - 6/30/2001), Center for Transportation and Logistics, Trans. Tech. Center, Inc., Oral Buyukozturk (PI), $19,915.75

Innovative Undergraduate Teaching Methods (1999-2000), University of Illinois, Oral Buyukozturk (PI), $25,000.00

Application of Composite Materials to Railroad Bridges (1/1/1999 - 12/31/1999), Center for Transportation and Logistics Trans. Tech. Center, Inc., Oral Buyukozturk (PI), $62,560.24

Uses of Fiber Rienforced Plastic's (FRP) in repair and Strengthening of Railroad Bridges (1/1/1998 - 12/31/1998), Center for Transportation and Logistics, Trans. Tech. Center, Inc., Oral Buyukozturk (PI), $39,522.68

Innovative Undergraduate Teaching Methods (1998-2000), University of Illinois, Oral Buyukozturk (PI), $45,000.00

Analyzing Aging of DOE Facilities Exposed to Man-Made and Natural Environmental Factors (4/16/1998 - 9/30/1998), Bechtel BWXT Idaho, LLC (BBWI), Oral Buyukozturk (PI), $83,884.00

Affiliated Research Program Task 3.60: Composites, Center for Transportation and Logistics (1/1/1997 - 12/31/1997), Association of American Railroads, Oral Buyukozturk (PI), $35,722.76

Integrity of Pre-Cracked Re-Enforced Concrete Retrofitted with Composite Laminates (1996-2000), NSF, Oral Buyukozturk (PI), $239,936.00

Behavior of High Strength Concrete Composites Influenced by Interfacial Fracture Properties (1994-1997), NSF, Oral Buyukozturk (PI), $246,655.00

- ✓ **PUBLICATIONS**

**BOOKS AND BOOK CHAPTERS**

Buyukozturk, O. et al. Finite Element Analysis of Reinforced Concrete, ISBN: 0-87262-307-6, ASCE Special Committee Publication, 546 pages, 1982.

Sacks, R. and Buyukozturk, O., An Expert System for Design of Reinforced Concrete Structures, Expert Systems in Engineering, ISBN: 0-387-19229-8, edited by D.T. Pham, IFS Publications/Springer-Verlag, 1988.

Buyukozturk, O. et al., Mathematical Modeling of Creep and Shrinkage of Concrete, ISBN: 0-47192057-6, edited by Z.P. Bazant, John Wiley & Sons, 1988. Chapter 3 Creep Analysis of Structures, pp.217-273. Chapter 4 Finite Element Analysis of Creep and Shrinkage, pp.275-310. Chapter 5 Probabilistic Models, pp.311-383, 1988

Fracture Mechanics of Concrete: Concepts Models and Determination of Material Properties, ISBN: 1-85166-869-1, Part 1 of Fracture Mechanics of Concrete Structures, Elsevier Applied Science Publication, Edited by Z.P. Bazant, pp. 3-140, 1992.

Buyukozturk, O., and Lee, K.M., Interface Fracture Mechanics of Concrete Composites, Chapter 1 of Part II Material Models for Concrete Fractures, ISBN: 1-85166-869-1, Elsevier Science Publisher, Essex, England, pp.145-223, 1992.

Buyukozturk, O., and Wecharatana, M., editors, Interface Fracture and Bond, ISBN: 95-77208, ACI SP-156, 1995.

Buyukozturk, O., "Fracture Mechanics Parameters Influencing the Mechanical Properties of Concrete Composites," Advanced Technology for Design and Fabrication of Composite Materials and Structures, Kluwer Academic Publishers, edited by George C. Sih, Alberto Carpinteni, pp. 319-331, 1995.

Buyukozturk, O. and Hearing, B., Influences of Mortar-Aggregate Interface Fracture on Concrete Behaviour, Chapter 4 in Festschrift zum 60. Geburtstag von Professor Dr.-Ing. Manfred Specht, ISBN: 3-540-63525-4, pp. 51-70, Springer-Verlag Berlin Heidelberg, 1998.

Buyukozturk, O., Hearing, B., and Gunes, O., Failure of Concrete Beams Strengthened with Fiber Reinforced Plastic Laminates, Chapter 3, Mechanics of Quasi-Brittle Materials and Structures, ISBN: 2-86601-729-3, edited by G.Pijaudier-Cabot, Z. Bazant, and B. Gerard, HERMES Science Publications, Paris, France, 1999.

Buyukozturk, O., and Ulm, F.-J., The Towers Lost and Beyond, Chapter 6 Materials and Structures, pp.83-106, edited by E. Kausel, MIT, Cambridge, MA, 2002.

Buyukozturk, O., Bungey, J.H., and Al-Qadi, I., editors, Construction and Building Materials, Special Issue on Non-Destructive Testing: Selected papers from Structural Faults and Repair 2003, Vol.19, No.10, 2005.

O. Buyukozturk and T.-Y. Yu, Chapter 7, A Novel Structural Assessment Technique to Prevent Damaged FRP-Wrapped Concrete Bridge Piers from Collapse, Seismic Risk Assessment and Retrofitting edited by A. Ilki et al., Springer, ISBN: 978-90-481-2680-4, 2009.

Büyu̇köztu̇rk, O., M.A. Tasdemir, O. Gunes, Y. Akkaya, editors (2013). Nondestructive Testing of Materials and Structures, RILEM Bookseries Vol. 6, 1278p 776 Ills., 370 in color (Part 1 p. 1-750, Part 2 p. 751-1278) Springer Publisher, 2013

S.D. Palkovic and O. Buyukozturk. Multiscale Modeling of Cohesive-Frictional Strength Properties in Cementitious Materials. Handbook of Materials Modeling: Applications: Current and Emerging Materials, 1-24, 2018.

J. Long and O. Buyukozturk " Learning Collaborative Duty Cycling Strategies in Energy-harvesting Sensor Networks", Chapter in Structural Health Monitoring 2019 Enabling Intelligent Life-cycle Health Management for Industry Internet of Things (IIOT), Edited by: Fu-Kuo Chang, Alfredo Güemes, Fotis Kopsaftopoulos, DEStech Publications

J. Al-Qazweeni, J. Parol, H. Kamal, A. Al-Enezi, A. Bin-Nakhi, H. Sun, O. Büyüköztürk. Structural Health Monitoring System for Al-Hamra Tower in Kuwait City. Chapter in Gulf Conference on Sustainable Built Environment 2020, pp. 279-286, Springer.

Dindar AA, Polat G, Yalçın C, Yüksel E, Özkaynak H, Büyüköztürk O. (2021). Assessment of Plastic Energy Demand Spectra on Frame Systems. In: Benavent-Climent, A., Mollaioli, F. (eds) Energy-Based Seismic Engineering. Lecture in Civil Engineering, vol 155, pp:1-10. Springer, Cham. https://doi.org/10.1007/978-3-030-73932-4_1

**REFEREED JOURNAL PAPERS**

Buyukozturk, O., Nilson, A.H. and Slate, F.O., "Stress-Strain Response and Fracture of a Concrete Model in Biaxial Loading," Journal of the American Concrete Institute, Vol. 68, No. 8, pp. 590-599, 1971.

Buyukozturk, O. and Nilson, A.H., "Deformation and Fracture of a Particulate Composite," Journal of the Engineering Mechanics Division, ASCE, Vol, 98, No. EM-3, pp. 581-593, 1972

Buyukozturk, O. and Marcal, P.V., "Strength of Reinforced Concrete Chambers under External Pressure," Paper No. 75 PVP-7, Transactions of the ASME Journal of Pressure Vessels Technology, pp. 309-314, 1975

Buyukozturk, O., "Nonlinear Analysis of Reinforced Concrete Structures," Journal of Computers and Structures, Vol. 7, pp. 149-156, 1977

Buyukozturk, O., and Connor, J.J., "Nonlinear Dynamic Response of Reinforced Concrete under Impulsive Loading: Research Status and Needs," Nuclear Engineering and Design, Vol. 50, No. 1, pp. 83-92, 1978

Code requirements for Nuclear Safety Related Concrete Structures, ACI Committee 349, Journal of the American Concrete Institute, Vol. 75, No. 8, pp.329-35, 1978

De Silva, C.W., Buyukozturk, O., and Wormley, D.N., "Postcracking Compliance Analysis of R/C Beams," Journal of the Structural Division - ASCE, Vol. 105, No. ST1, pp. 35-51, 1979

Fardis, M.H., and Buyukozturk, O., "Shear Transfer Model for Reinforced Concrete," Journal of the Engineering Mechanics Division - ASCE, Vol. 105, No. EM2, pp. 255-275, 1979.

Fardis, M.N., and Buyukozturk, O., "Shear Stiffness of Concrete by Finite Elements," Journal of the Structural Division - ASCE, Vol. 106, No. ST6, pp. 1311-1337, 1980.

Reinforced Concrete Design for Therman Effects on Nuclear Power Plant Structures, ACI Committee 349, Journal of the American Concrete Institute, Vol. 77, No. 6, pp. 399-428, 1980.

Code Requirements for Nuclear Safety Related Concrete Structures, ACI 349R-80, Commentary: American Concrete Institute, Special Committee Publication. (Adopted as a standard of the American Concrete Institute),1980

Buyukozturk, O., Connor, J., and Leombruni, P., "Research on Modeling Shear Transfer in Reinforced Concrete Nuclear Structures," Nuclear Engineering and Design, Vol. 59, No. 1, pp. 67-83, 1980.

Reinforced Concrete Design for Thermal Effects on Nuclear Power Plant Structures, ACI 349.IR-80, Special ACI Committee Publications, 1981

Buyukozturk, O. and Tseng, T. M., "Thermomechanical Behavior of Refractory Concrete Linings," Journal of the American Ceramic Society, Vol. 65, No. 6, pp. 301-307, 1982.

Buyukozturk, O., Connor, J.J., Calvo, J.J., and Tseng, T.M., "Numerical Modeling of Reinforced Concrete Containment Walls Under Cyclic Shear," Nuclear Engineering and Design, Vol. 69, No. 2, pp. 261-270, 1982.

Buyukozturk, O. and Tseng, T. M., "Heat Conduction through Layered Refractory Linings," Journal of the Engineering Mechanics Division, ASCE, Vol. 109, No. EM4, pp. 1000 –1015, 1983.

Browzin, B.S., Tulga, S.S., and Buyukozturk, O., "Testing and Verification Analysis by Finite Elements of Reinforced Concrete Double Cantilevers," Nuclear Engineering and Design, Vol. 79, pp. 187-197, 1984.

Wium, Daniel J.W. and Buyukozturk, O., "Precast Segmental Bridges - Status and Future Directions," The Journal of Civil Engineering for Practicing and Design Engineers, Vol. 3, pp. 59-79, 1984.

Buyukozturk, O., and Tseng, T.M., "Concrete in Biaxial Cyclic Compression," Journal of the Structural Division, ASCE, Vol. 110, No. ST3, pp. 461-476, 1984.

Wium, Daniel J.W., Buyukozturk, O., Li, V., "Hybrid Model for Discrete Cracks in Concrete," The Journal of Engineering Mechanics, ASCE, Vol. 110, No. 8, pp. 1211-1229, 1984.

Wium, D.J.W., and Buyukozturk, O., "Problems in Designing Prestressed Segmental Concrete Bridges," Transportation Research Board Record, National Academy of Sciences, Second Bridge Engineering Conference, Vol. 2, pp. 68-75, 1984.

Chen, E.S., and Buyukozturk, O., "Thermomechanical Behavior and Design of Refractory Linings, for Slagging Gasfiers," American Ceramic Society Bulletin, Vol. 64, No. 7, pp. 988-994, 1985.

Chen, E.S., and Buyukozturk, O., "Constitutive Model for Concrete in Cyclic Compression," Journal of Engineering Mechanics, ASCE, Vol. 111, No. 6, pp. 797-814, 1985.

Chen, E.S., and Buyukozturk, O., "Modeling of Long Term Corrosion Behavior of Refractory Linings in Slagging Gasfiers," American Ceramic Society Bulletin, Vol. 64, No. 7, pp. 995-1000, 1985.

Wium, Daniel J.W., and Buyukozturk, O., "Variability in Long-Term Concrete Deformations," Journal of Structural Engineering, ASCE, Vol. 111, No. 8, pp. 1792-1809, 1985.

Buyukozturk, O. and Shareff, S. S., "Constitutive Model for Concrete in Cyclic Compression," Journal of Computers and Structures, Vol. 21, No. 3, pp. 581 – 610, 1985.

Chen, E.S. and Buyukozturk, O., "Methodology for Thermomechanical Analysis of Brittle Systems," American Ceramic Society Bulletin, Vol. 64, No. 7, pp. 982-988, 1985.

Sacks, R. and Buyukozturk, O., "Expert Interactive Design of R/C Columns Under Biaxial Bending," The Journal of Computing in Civil Engineering, Vol. 1, No. 2, pp. 69-81, 1987.

Chen, E.S., Dicks, L.R., and Buyukozturk, O., "Anchor-Lining Interaction in a Hot-Shell Lining," Ceramic Bulletin, Vol. 69, No. 11, pp. 1813-1820, 1990.

Buyukozturk, O., Bakhoum, M.M., Beattie, S.M., "Shear Behavior of Joints in Precast Concrete Segmental Bridges," ASCE Journal of Structural Engineering, Vol. 116, No. 12, pp.3380-3401, 1990.

Buyukozturk, O., Moussa, R.A., "A Bounding Surface Model For Concrete," Journal of Nuclear Engineering and Design, Vol. 121, pp. 113-125, 1990.

Buyukozturk, O. and Lee, K.M., "Mixed Mode Fracture Concepts in Structural Design," Special Publication Series of American Concrete Institute, SP-134, pp. 47-62, 1992.

Fracture Mechanics; Applications to Concrete Structures and Implications with Regard to the Code, ACI special publication of the Committee 446. Fracture Mechanics, 1992

Pagnoni, T., Slater, J., Ameur-Moussa, R., Buyukozturk O., "A Nonlinear Three-Dimensional Analysis of Reinforced Concrete Based on a Bounding Surface Model," Journal of Computers and Structures, Vol. 43, No. 1, pp. 1-12, 1992.

Lee, K.M., Buyukozturk, O., and Oumera, A., "Fracture Analysis of Mortar-Aggregate Interfaces in Concrete," ASCE Journal of Engineering Mechanics, Vol 118, No. 10, pp. 2031-2047, 1992.

Valle, M. and Buyukozturk, O., "Behavior of Fiber Reinforced High Strength Concrete Under Direct Shear," Materials Journal of American Concrete Institute, Vol. 90, No. 2, pp. 122-133, 1993.

Buyukozturk, O., and K.M. Lee, "Assessment of Interfacial Fracture Toughness in Concrete Composites," Cement & Concrete Composites, Vol. 15, pp.143-151, 1993.

Lee, K.M., Buyukozturk, O and Leung, C.K.Y., "Numerical Evaluation of Interface Fracture Parameters Using ADINA," Journal of Computers and Structures, Vol. 47, No. 4/5, pp. 547-552, 1993.

Valle, M., and Buyukozturk, O., "Behavior of Fiber Reinforced High Strength Concrete Under Direct Shear," Fiber Reinforced Concrete Developments and Innovations, ACI SP-142, pp. 201-233, 1994.

Lee, K.M., Buyukozturk, O., "Fracture Toughness of Mortar-Aggregate Interface in High Strength Concrete," ACI Materials Journal, V. 92, No. 6, pp.634-642, 1995.

Buyukozturk, O., and Rhim, H.C., "Modeling of Electromagnetic Wave Scattering by Concrete Specimens," Journal of Cement and Concrete Research, Vol. 25, No. 5, pp. 1011-1022, 1995.

Rhim, H.C., and Buyukozturk, O. Blejer, D.J., "Remote Radar Imaging of Concrete Slabs With and Without a Rebar," Materials Evaluation, The Journal of the American Society of Nondestructive Testing, Vol. 53, No. 2, pp. 295-299, 1995.

Finite Element Analysis of Fracture In Concrete Structures, reported by ACI Committee 446 of which O. Buyukozturk was sub-committee member 3 contributing to the report, American Concrete Institute, 1996

State of the Art Report on Dynamic Fracture, reported by ACI Committee 446, of which O. Buyukozturk was a contributing member , American Concrete Instutue R-8860, 1996

Shahbazker, A., and Buyukozturk, O., "Shear Design and Behavior of Fiber Reinforced High Strength Concrete Beams," ACI Structural Journal. 1996

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"Time Dependent Material Nonlinear Analysis and Formulations for Large Displacement and Finite Strain," Lectures at Structural Dynamics Research Corp., Cincinnati, OH, January 1977.

"Material Nonlinear Three-Dimensional Analysis of Concrete Structures," ASCE Fall Convention, Chicago, IL., October, 1978.

"Analysis of Coal Gasification Process Vessels," Fall Convention of the American Ceramic Society, Bedford, PA., October, 1979.

"Finite Element Modeling of Shear Transfer in Concrete," Lecture at the University of Connecticut, Storrs, CT., February, 1979.

"Concrete: Chemical and Structural Properties," three-hour lecture for CMRAE, Massachusetts Institute of Technology, Cambridge, MA, February, 1979.

"Constitutive Models for Numerical Analysis of Concrete Structures," invited state-of-the-art lecture, ASCE Fall Convention, Atlanta, GA, October, 1979.

"Design of Offshore Gravity Structures," series of lectures for the 7th Regional Conference on Earthquake Engineering, Istanbul, Turkey, September, 1979.

"Analytical Approach for Evaluation of Codes, Standards and the Inherent Safety Margin in Safety-Related Concrete Structures," 8th Water Reactor Safety Research Meeting, U.S. Nuclear Regulatory Commission, Washington, D.C., October 31, 1980.

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"Mathematical Modeling of Refractory Concrete, Lecture on Monolithic Refractory Lining Design for Process Vessels," Industry Workshop, Babcock and Wilcox Research Labs, Lynchburg, VA., September 17-18, 1980.

"What is Engineering?: Design and Construction of Fixed Offshore Structures," Freshman Seminar, Massachusetts Institute of Technology, Cambridge, MA, October 1980.

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"Nonlinear Analysis by Finite Elements," lectures on Finite Element Method in Engineering Mechanics, organized by the Drilling Resources Development Co., Tulsa, OK., January 1982.

"Material Behavior Characterization for Refractories," U.S. Department of Energy, Germantown, MD., June 8, 1982.

"Series of Presentations on Experimental and Analytical Investigations in Concrete Bridge Engineering," Technical University of Berlin, West Germany, June 21-24, 1982.

"Advances in Finite Element Methods in Structural Mechanics," lectures in Special Summer Courses for Professionals, Massachusetts Institute of Technology, Cambridge, MA, 1977-1982.

"Development of Analytical Models for Describing Thermomechanical Behavior of Refractory Systems," Argonne National Laboratories, Argonne, IL, January 6, 1983.

"Behavior of Engineering Materials for High Temperature Applications," CEMCOM Research Association, Prince Frederick, MD., January 28, 1983.

"Analysis of Concrete Structures for High Temperature Effects," Engineering Mechanics Seminar, Istanbul Technical University, Ayazaga, Istanbul, Turkey, May 5, 1983.

"Design of Offshore Structures," Special Short Course, Istanbul Technical University (sponsored through the Technology Transfer Program of the United Nations), Istanbul, Turkey, March, 1983.

"Numerical Modeling of the Behavior of Concrete in Cyclic Stress," Materials Seminar, Istanbul Technical University, Ayazaga, Istanbul, Turkey, May 30, 1983.

"Finite Element Analysis of Reinforced Concrete Structures," Agean University, Izmir, Turkey, May 13, 1983.

"Fundamentals of Offshore Engineering," Middle East Technical University, Institute of Marine Sciences, Erdemli Mersin, June 6, 1983.

"A Hybrid Finite Element-Dislocation Method to Model Discrete Cracking in Concrete," USNetherlands Cooperative Research, Delft, Netherlands, June 22-24, 1983.

"A Plasticity-Based Damage Model to Predict Response of Concrete to Multiaxial Cyclic Loading," US-Netherlands Cooperative Research, Delft, Netherlands, June 22-24, 1983.

"Thermomechanical Behavior of Monolithic Refractories," Norton Co., (Video-taped), Worcester, MA, September, 1983.

"Thermomechanical Behavior of Coal Gasification Vessels," Massachusetts Institute of Technology, Department of Civil Engineering, Cambridge, MA, September 11, 1983.

"Segmental Concrete Bridges," Transportation Research Board, Minneapolis, MN, September, 1984

"Three Dimensional Finite Element Analysis of Thermomechanical Stresses in Brittle Materials," Oak Ridge National Laboratories, Oak Ridge, TN, March 21, 1984.

"Thermomechanical Modeling of Refractory Linings for Slagging Gasifiers," Advanced Research and Technology Development Program, US Department of Energy, Washington, DC, February 9, 1984.

"High Temperature Applications of Ceramics and Refractories," Synthetic Fuels Center, Energy Laboratories, Massachusetts Institute of Technology, Cambridge, MA, May 4, 1984.

"Failure of Segmental Bridges," Technical University of Berlin, Berlin, West Germany, Feb. 23, 1984.

"Innovative Concepts in Concrete Bridge Design," lAP-I 52 Civil Engineering, Massachusetts Institute of Technology, Cambridge, MA, January, 31, 1984.

"Short Course on Finite Element Analysis of Concrete Structures," Technical University of Berlin, Berlin, West Germany, June, 1985.

"Finite Element Analysis of Reinforced Concrete," US-Japan Conference, Tokyo, Japan, May, 1985.

"Lining System Design," ARMCO, Middleton, OH, March, 1985.

"High Temperature Materials," Norton Co., Worcester, MA, October, 1985.

"Prestressed Concrete Bridge Design in the USA," two invited papers in the Symposium on Concrete Structures, Berlin, West Germany, April 1985.

"Fracture of Concrete," 4th International Conference on Numerical Methods in Fracture Mechanics, San Antonio, TX., March, 1987.

"The Use of Computers in Engineering Analysis and Design," European Symposium on Computational Methods, Istanbul Technical University, Istanbul, Turkey, June, 1988.

"Use of Epoxies in Concrete Bridges," Annual Meeting of Transportation Research Board, Washington, DC, January, 1988.

"Fracture Behavior of Brittle Materials and Systems," Department of Civil Engineering, Princeton University, Princeton, NJ, January, 1988.

"Segmental Box Girder Bridges," Department of Ocean Engineering, FL. Atlantic University, Boca Raton, FL., March, 1988.

"High Temperature Creep Behavior of Refractory Concretes," USINOR, Metz, France, July, 1989.

"Design of High Temperature Systems," RADEX, Radenthein, Austria, June, 1989.

"Behavior of Concrete Bridges," Technical University of Berlin, Berlin, West Germany, July, 1989.

"Assessment of the Fatigue Life of Railway Bridges," Presentation at the AAR Affiliated Rail Program at Massachusetts Institute of Technology, Cambridge, MA, October 30, 1991.

"Fracture Behavior of Aggregate Mortar Interfaces," American Concrete Institute, Spring Convention, Session on Fracture Mechanics of Dams, Boston, MA, March 17-21, 1991.

"High Strength Cement Composites for Marine Applications," Massachusetts Institute of Technology, Sea Grant Marine Industry Colloquium on Advanced Composites for Offshore Structures, Cambridge, MA, October 30-31, 1991.

"Characterization of Fiber Reinforced High Strength Concrete," International Symposium for Developments in Fiber Reinforced Concrete and Ferrocement, American Concrete Institute, 1991 Fall Convention, Session II, Dallas, TX., November 10-15, 1991.

"Development of High performance Materials," Symposium L004 on Innovation in Development and Characterization of Materials for Infrastructure, Materials Research Society 1991 Fall Meeting, Boston, MA., December 2-6, 1991.

"Fiber Reinforced Concrete Composites," Lecture at Milan Polytechnic, Milan, Italy; May 23, 1991.

"High Performance Material Development," Lecture at Itali-Cement, Bergamo, Italy; May 24, 1991.

Lectures at Technical University of Berlin, Berlin, Germany: "Application of Fiber Reinforced Concrete Composites to Innovative Bridge Design," April 24, 1991; "Application of Interface Fracture Mechanics to Concrete," April 25, 1991.

Lectures at Swiss Federal Institute of Technology (ETH) Zurich, Switzerland: "Mixed Mode Effects in Crack Propagation," presented in the Research Colloquium Organized at ETH, May 15, 1991.

Lectures at Swiss Federal Institute of Technology (ETH) Zurich, Switzerland: "Interface Fracture Concepts with Application to Concrete Composites," May 28, 1991.

Lectures at Swiss Federal Institute of Technology (ETH) Zurich, Switzerland: "Mixed Mode Fracture Concepts in Structural Design," May 22, 1991.

Lectures at Swiss Federal Institute of Technology (ETH) Zurich, Switzerland: "Behavior of Joints in Precast Concrete Segmental Bridges," May 13, 1991.

Lectures at Swiss Federal Institute of Technology (ETH) Zurich, Switzerland: "Behavior of Fiber Reinforced High Strength Concrete in Direct Shear," May 7, 1991.

Lectures at Technical University of Istanbul, Turkey: "Design of Precast Concrete Bridges," July 12, 1991; "Effect of Mixed Mode Crack Propagation in Concrete Design," July 23, 1991; "Microcracking in

Concrete Composites," July 24, 1991; Fiber Reinforced High Strength Concrete Development, July 25, 1991.

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"Innovative Bridge Design Using Advanced Materials," Lectures at Middle East Technical University, Ankara, Turkey, July 16, 1991.

"Fiber Reinforced High Strength Concrete in Innovative Structural Solutions", CFD Seminar, Department of Civil Engineering, Massachusetts Institute of Technology, Cambridge, MA, , October 22, 1991.

"Application of Fiber Reinforced Concrete Composites to Offshore Structures," Seminar at Florida Atlantic University, Department of Ocean Engineering, Boca Raton, FL., November 8, 1991.

"Engineering Aspects of Preserving Historic Buildings," Workshop on Protection of Architectural Heritage Against Earthquakes, organized by the European Natural Disasters Center, Ankara, Turkey, September 28-October 2, 1992.

"High Performance Materials and Design," lAP - 98 Lectures held at Massachusetts Institute of Technology, Cambridge, MA, January 6 - 13, 1992.

"Bridge Fatigue Assessment," American Railway Engineering Association Affiliated Laboratory Meeting, Massachusetts Institute of Technology, Cambridge, MA, April 23-24, 1992.

"Fracture of Interfaces in Particulate Composites," Northeastern University, Department of Mechanical Engineering, Research Colloquium Series, Boston, MA, May 8, 1992.

"Finite Element Simulation of Cracking in Interfacial Regions of Particulate Composites," 3rd International Symposium on the Use of Computers in Engineering Problem Solving, Istanbul, Turkey, June 15-18, 1992.

"Fracture of Interfaces in Concrete Composites," Ray Clough Symposium on Computational and Analytical Methods for Structures with Nonlinear Material Behavior, Damage and Fracture, 29th Annual Technical Meeting of the Society of Engineering Science, UCSD, La Jolla, CA., September 14-16, 1992.

"Fracture Mechanics Parameters Influencing the Mechanical Properties of Concrete Composites," International Symposium on Advanced Technology on Design and Fabrication of Composite Materials and Structures, Turin Polytechnic Institute, Turin, Italy, May 24-28, 1993.

Plenary Keynote: "Temperature Dependent Creep and Creep-Crack Interaction in Concrete," Fifth RILEM International Symposium on Creep and Shrinkage of Concrete, Technical University of Catalunya, Catolonia, Barcelona, Spain, September 6-9, 1993.

"High Performance Materials and Nondestructive Evaluation of Concrete Structures," Faculty Seminar, Massachusetts Institute of Technology, Cambridge, MA, February 23, 1993.

"Radar Imaging Techniques in Civil Engineering," Conference on Digital Imaging Processing Techniques and Application in Civil Engineering, sponsored by Engineering Foundation, Kona, Hawaii, February 28- March 5, 1993.

"Interface Fracture and Crack Propagation in Concrete Composites," 13th Annual Materials Conference on Micromechanics of Concrete and Cementitious Composites, Swiss Federal Institute of Technology, Lausanne, Switzerland, March 9-11, 1993.

"Precast Concrete Segmental Bridges: Construction and Design Problems," Conference on New Technologies in Civil Engineering, organized by the Turkish Association of Engineers, Ankara, Turkey, May 25, 1993.

"Use of High Frequency Wideband Radar for Condition Assessment of Infrastructure," Raytheon Company, Equipment Development Laboratory (Greg Behr, Manager), Sudbury, MA., May 24, 1994.

"Simulation of Wideband Radar Measurements for Concrete," Structural Materials Technology – An NDT Conference, Sponsored by FHWA and NJDOT, Atlantic City, New Jersey, February 23-25, 1994.

"Thermomechanical Deformation Model or High Temperature Fluewall Systems," Comalco Research and Technology Center, Thomastown, Victoria, Australia, June 2, 1994.

"Thermomechanical Design of Carbon Bake Furnaces for the Aluminum Production Facilities," New Zealand Aluminum Smelters, Invercargill, New Zealand, June 7, 1994.

"Design and Construction of Segmental Prestressed Concrete Bridges - A Case Study: Imrah Viaduct," Middle East Technical University, Department of Civil Engineering, Turkey, March 18, 1994.

"Fatigue Damage Assessment and Prediction of Remaining Life of Railroad Steel Bridges," Lecture given to a large group of Japanese Industrial and University representatives, organized by MIT Industrial Liason Office and Professor Tetsuo Yai of Tokyo Institute of Technology, MIT E-38, May 4, 1994.

"Wideband Radar Imaging of Concrete Dams," Workshop Presentation at Waterway Experiment Station, Vicksburgh, MS, May 9, 1994.

"Nondestructive Testing of Concrete Using Radar," main lecture in International Symposium on Nondestructive Testing in Civil Engineering (NDT-CE), Berlin, Germany, September 26-28, 1995.

"Computational Methods in Material Design and Assessment Technology," American Concrete Institute, 1995 Spring Convention, Salt Lake City, Utah, March 5-10, 1995.

"Deterioration and Fatigue Life Prediction of Steel Railway Bridges," ICSAS '95 Third International Conference on Steel and Aluminum Structures, Istanbul, Turkey, May 24-26, 1995.

"Radar Imaging of Reinforced Concrete Specimens for Non-destructive Testing," International Conference on Non-destructive Evaluation of Aging Infrastructure organized by the International Society for Optical Engineering (SPIE), Oakland, CA, June 6-8, 1995.

"Radar Measurements of Concrete for Non-destructive Evaluation of Dams," International Conference on Non-destructive Evaluation of Aging Infrastructure organized by the International Society for Optical Engineering (SPIE), Oakland, CA, June 6-8, 1995.

"Radar Imaging of Concrete Specimens for Non-destructive Testing," 6th International Conference on Structural Faults and Repair - 95, Westminster, London, July 3-5, 1995.

"Nondestructive Testing Methods in Civil Engineering" at the Department of Civil Engineering, Institute for Structures and Construction, Technical University of Berlin, Berlin, Germany, September 29, 1995.

"International Symposium on Nondestructive Testing (NDT-CE)," Liverpool, England. July 1997.

"Use of Composite Materials in Repair and Retrofit of Structures," PPG Industries, Fiber Glass Research Center, Pittsburgh, Pennsylvania, 1998.

Plenary Keynote: "Assessment and Repair of Reinforced Concrete Structures," International Conference on Repair and Restoration of Reinforced Concrete Structures, Budapest, Hungary, April 15-16, 1998.

"Deterioration and Nondestructive Evaluation of Concrete," International Symposium on Performance of Concrete Structures in the Arabian Gulf Environment, Dhahran, Saudi Arabia, November 15-17, 1998.

"Failure of Concrete Strengthened with Composite Laminates," International Workshop on Mechanics of Quasi-Brittle Materials and Structures, Prague, Czech Republic, March 26-28, 1998.

"Nondestructive Testing Using Microwave," International Conference on Repair and Restoration of Reinforced Concrete Structures, Budapest, Hungary, April 15-16, 1998.

"Performance of Retrofitted Concrete Using FRP," International Symposium on Performance of Concrete Structures in the Arabian Gulf Environment, Dhahran, Saudi Arabia, November 15-17, 1998.

"Assessment and Repair of Earthquake Damaged Buildings," Earthquake Emergency Conference, Bogazici University, Istanbul, Turkey, September 2, 1999.

Plenary Keynote: "Strengthening and repair of structures using FRP materials," International Conference on Strengthening or upgrading Structures Using advanced Composite Materials, Organized by Singapore Concrete Institute, Singapore, May 27, 1999.

Plenary Keynote: "FRP strengthening and repair: Where do we go from here?" 8th International Conference and Exhibition, Structural Faults and Repair 99, London, England, July 13-15, 1999.

Plenary Keynote: "Strengthening and Repair of Existing Structures Using FRP Composites," 15th Technical Congress of the Turkish Society of Civil Engineers, Ankara, Turkey, November 24-26, 1999.

Plenary Keynote: "Advanced Technologies in Earthquake Engineering: assessment and Strengthening," Keynote Lecture, ITU-IAHS International Conference on the Kocaeli Earthquake, 17 August 1999, Istanbul, Turkey, December 2-5, 1999.

Plenary Keynote: "Deterioration and Nondestructive Evaluation of Concrete Structures," National University of Singapore, Singapore, May 25, 1999.

"Fracture Behavior and Ductility of High Strength Concrete," National University of Singapore, Singapore, May 31, 1999.

"Strengthening and repair of Structures Using FRP Composites," National University of Singapore, Singapore, June 2, 1999.

"Information Technology and Nondestructive Evaluation of Structures," 6th International Conference on Structural Failure Durability and Retrofitting, Singapore, September 14-15, 2000.

Plenary Keynote: "Nondestructive Evaluation of Concrete," The International Conference on High Performance Concrete, Hong Kong, Shenzhen, December 10-15, 2000.

Plenary Keynote: "Multi Resolution Assessment of Structural Integrity," National University of Singapore (NUS)-MIT Conference on Sustainable Infrastructure Development, January 26, 2000.

Plenary Keynote: "Repair and Strengthening of Reinforced Concrete Structures," IMO(Professional Engineering Society) Symposium on Earthquake Engineering, Istanbul, Turkey, July 5, 2000.

Plenary Keynote: "Innovative Technologies in Earthquake Resistant Structures," 6th International Conference on Structural Failure Durability and Retrofitting, Singapore, September 14-15 2000.

"Base Isolation: An Innovative Technology for Seismic Retrofit of Buildings," Istanbul Technical University, Istanbul, Turkey, May 22, 2001.

Plenary Keynote: "Use of Concrete in Tall Buildings, Keynote Lecture," Symposium on Building a Safer, Stronger New York City, New York, NY, December 13, 2001.

"Base Isolation of Historical Buildings of Robert College in Istanbul – A Case Study," Gebze Institute of High Technology, Gebze, Turkey, May 24, 2001.

"Collapse of World Trade Center Towers," A forum on Structural Engineers Perspectives of the World Trade Center, Massachusetts Institute of Technology, Cambridge, MA, October 3, 2001.

"Monitoring Fatigue Crack Growth in Steel Bridges Using Acoustic Emission Techniques," presentation to the Technology Scanning Committee of American Association of Railroads, October 11, 2001.

"Material Research and Development at MIT," DARPA Battle Damage Indicator Workshop, Institute for Defense Analyses, Alexandria, Virginia, November 1, 2001.

"Earthquake Risk Assessment and Hazard Reduction for Structures: Opportunities for Synergistic Collaboration," NSF-TUBITAK Turkey/Taiwan Grantee Workshop, Antalya, Turkey, March 24-26, 2002.

Plenary Keynote: "Advances in Earthquake Risk Assessment and Hazard Reduction for Large Scale Inventory of Structures with High Characteristic Variability," 5th International Congress on Advances in Civil Engineering, Istanbul, Turkey, September 25-27, 2002.
"Recent Developments in Advanced Construction Materials and Assessment Technologies," CEMEX International, Monterrey, Mexico, September 13, 2002.

"Development of FRP Composites for Infrastructure Applications," FHWA/DOT/FRA/FTA Workshop, Washington DC, November 21, 2002.

"Characterization and Modeling of Debonding in RC Beams Strengthened with FRP Composites," 15th ASCE Engineering Mechanics Conference, New York, NY, June 2-5, 2002.

"Debonding Problems in Seismic Retrofitting of RC Beams Using FRP Composites," 7th U.S. National Conference on Earthquake Engineering, Boston, Massachusetts, July 21-25, 2002.

"Damage Mechanics and Detection in FRP Bonded Systems: Potential Role of Finite Element Method," 2nd US-Japan Workshop on FEARCS, Makena, Maui, November 2-4, 2003.

Plenary Keynote: "Non-destructive Evaluation of FRP Confined Concrete using Microwave," NDTCE, International Conference on Nondestructive Testing in Civil Engineering, Berlin, Germany, September 13, 2003.

Plenary Keynote: "Understanding Debonding Problems in Reinforced Concrete and Steel Members Strengthened using FRP composites," International Conference on Structural Faults and Repair, Commonwealth Institute, London, UK, July 1-3, 2003.

Plenary Keynote: "Structural Health Monitoring and Seismic Impact Assessment," 5th National Conference on Earthquake Engineering, Istanbul, Turkey, May 26-30, 2003.

"Use of Advanced Composites n Maglev Guideway Systems – The MIT Perspective," USDOT/TRB Meeting, Washington D.C., January 12-14, 2003.

"Structural Failures: Causes and Effects," Disaster Management Center, Istanbul Technical University, Maslak main campus, Istanbul, Turkey, May 27, 2004.

Plenary Keynote: "The Collapse of Twin Towers: Causes and Effects," EFCA2004 Conference and GAM, Istanbul, Turkey, May 22-27, 2004.

Plenary Keynote: "High-rise Buildings: Evolution and Innovations," CIB2004 World Building Congress, Toronto, Canada, May 2-7, 2004.

"Nondestructive Evaluation of FRP-confined Concrete using Microwave," MIT-Lincoln Laboratory, Lexington, Massachusetts, December 14, 2005.

"Challenges in Civil and Environmental Engineering Education – Materials and Structural Systems", NSF sponsored International Workshop on Reforming Civil and Environmental Engineering Education, Istanbul, Turkey, October 4, 2006.

Plenary Keynote: "Understanding and assessment of debonding failures in FRP-concrete systems", 7th International Congress on Advances in Civil Engineering (ACE-2006), Istanbul, Turkey, October 11, 2006.

Plenary Keynote: "Detecting deterioration behind GFRP-wrapped strengthening of bridge columns", 11th International Conference on Structural Faults + Repair – 2006, Edinburgh, Scotland, UK, June 12, 2006.

"Hygro-thermo Effects in FRP-Concrete Systems – A Tri-layer Fracture Problem," Annual Mustafa Inan Lecture, Istanbul Technical University, Istanbul, Turkey, April 18, 2006.

"How Durable is FRP-Plated Concrete under Moisture?" International Conference on FRPRCS- 8, University of Patras, Patras, Greece, July 16-18, 2007.

"Civil Engineering Education: Do We Need a Fifth Year?" First FABED International Workshop on Challenges in Civil Engineering Education in View of Societal and Technical Realities, ITU, Istanbul, Turkey, October 22-23, 2007.

"High Performance Concrete: Fundamentals and Application," International Conference on New Developments in Concrete Technologies, Istanbul, Turkey, November 27-28, 2007.

"A Novel Structural Assessment Technique to Prevent Damaged FRP-Wrapped Concrete Bridge Piers from Total Collapse," International Workshop on Measures for the Prevention of Total Collapse of Existing Low-Rise Structures, Istanbul, Turkey, November 19-20, 2007.

A Distant Real-time Radar NDE Technique for the in-depth Inspection of Glass Fiber Reinforced Polymer-retrofitted Concrete Columns," 15th Annual International Symposium on "Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring" of SPIE, San Diego, California, March 11-12, 2008.

Plenary Keynote: "Durability of Cementitious Materials," 11th International Conference on the Durability of Building Materials and Components, Istanbul, Turkey, May 11-14, 2008.

Civil Engineering Education Reform, ASCE Structures Congress, Austin, April 30, 2009.

Plenary Keynote: "Very High Frequency Radar and Non-contact NDT", Telford Institute Workshop on "Developments in Sonic & Radar NDT of Infrastructure", May 12, 2009, Edinburgh, Scotland.

Plenary Keynote: "Engineering Education for a Changing World", International Engineering Education Conference, November 4, 2010, Antalya, Turkey.

Plenary Keynote: "Earthquake Risk Assessment and Hazard Reduction for Large Inventory of Structures", Conference on Advances in Earthquake Engineering, Turkish Chamber of Civil Engineers, November 6, 2010, Antalya, Turkey.

O. Buyukozturk (2011), "Remote Detection of Debonding in FRP-strengthened Concrete Structures using Acoustic-Laser Technique", International Symposium on Nondestructive Testing of Materials and Structure, Istanbul, Turkey, May, 2011.

Plenary Keynote: Buyukozturk, O. (2011), "Bridge Engineering and Education: Developments and Challenges", 2nd Symposium on Bridges and Viaducts, IMO, Eskişehir 28 – 30 September 2011.

Opening Plenary Keynote lecture Buyukozturk, O. (2012), "Deterioration and performance modeling of epoxy concrete interfaces in structures ", 1st International Conference on Performance-based and Life-cycle Structural Engineering (PLSE) 2012, Hong Kong, China, December 5, 2012.

Plenary Keynote: Buyukozturk, O. (2012), "Restructuring Engineering Education Curriculum", International Engineering Education Conference, October 31, 2012, Antalya, Turkey.

Plenary Keynote: Buyukozturk, O. (2012), "Deterioration and performance modeling of epoxy concrete interfaces in structures", 1st International Conference on Performance-based and Lifecycle Structural Engineering (PLSE) 2012, Hong Kong, China, December 5, 2012.

Plenary Keynote: Buyukozturk, O. (2012), "Durability and Long-Term Performance Modeling of FRPConcrete Systems", Proceedings of the 6th International Conference on FRP Composites in Civil Engineering CICE 2012, Rome, Italy, June 13-15, 2012.

Invited lecture Buyukozturk, O. (2012), "Developments in Engineering Research and Education", City University of Hong Kong, Hong Kong, China, December 7, 2012.

Invited presentation Buyukozturk, O. (2012), "Sustainability of Built Environment", Workshop organized by Kuwait Foundation for the Advancement of Science, Kuwait, January 17, 2012.

Invited lecture Buyukozturk, O. (2012), "New Trends in Engineering Research and Education", Hong Kong University of Science and Technology (HKUST), Hong Kong, China, December 3, 2012.

Invited presentation Buyukozturk, O. (2012), "Material Innovations and Sustainability in Civil Infrastructures", NSF CMMI Engineering Research and Innovation Conference, July 11, 2012.

Plenary Keynote lecture Buyukozturk, O. (2012), "Restructuring Engineering Education Curriculum", International Engineering Education Conference, October 31, 2012, Antalya, Turkey.

Plenary Keynote lecture Buyukozturk, O. (2012), "Durability and Long-Term Performance Modeling of FRP-Concrete Systems", 6th International Conference on FRP Composites in Civil Engineering CICE 2012, Rome, Italy, June 15, 2012.

Buyukozturk, O. (2013) "Sustainability of Kuwait's Built Environment", Kuwait-MIT Center for Natural Resources and the Environment (CNRE), MIT, October 8, 2013 (Cambridge, MA)

"Monitoring Seismic Safety and Structural Integrity of Tall Buildings, 8th Gulf Seismic Forum, Muscat, Oman, March 3, 2013.

Buyukozturk, O. (2013) "Motion sensing and damage detection of facilities using wireless sensor networks", Shell-MIT Workshop on Grand Challenges, January 31,2013. Shell Technology Centre, Rijswijk, Netherlands

"Multi-sensor monitoring of structures, measurement, inference, and visualization", Shell External Sponsored Research Workshop, Houston, January 28,2014,Texas, USA.

"Perspectives on Quantitative Sustainability of Civil Infrastructure", 11th International Congress on Advances in Civil Engineering (ACE), October 21,2014, Istanbul, Turkey (Plenary Keynote Lecture)

"2ECEES Energy-based Design for Seismic Resistance", Aug. 28, 2014, Second European Conference on Earthquake Engineering and Seismology (2ECEES), Istanbul, Turkey, 2014.

"Measurement based system identification and modeling approach for dynamic analysis of tall buildings: Case study of Green Building at MIT campus", Kuwait University, Kuwait City, Kuwait, 2014

"Research Trends and Field Measurement Based System Identification of a Tall Building at MIT", Istanbul Technical University, Istanbul, Turkey, February 24,2014

"Blind Modal Identification and Substructural Model Updating of High Rise Buildings" April 6-9, 2015, 9th Gulf Seismic Forum, Kuwait Institute for Scientific Research.

"Grand Challenges for Sustainable Infrastructure", Infrastructure Innovation in a Changing Environment, MIT CEE and ILP, Cambridge, MA November 20, 2015.

Plenary Keynote: International Conference on advances in Civil and Environmental Engineering (ICOCEE), Copadoccia, Turkey, May 20, 2015.

"Advances in Infrastructure" May 21, 2015 University of Nevsehir School of Engineering. 2015.

"Advanced Technologies for Sustainable Structures" PTC Holding Corporation, presentation to engineers and executives, Makati City, Manila, Philippines, July 18, 2016.

"Distributed Sensing and Wireless Monitoring of Structures" MITEI- Shell Research Conference, Cambridge, MA, May 11, 2016.

"Quantitative Sustainability of Infrastructure: Innovation in Materials and Structural Sensing" Institute of Structural Engineering, ETH Zurich, Switzerland, May 30, 2016.

Innovative Structural Technologies for the Assessment of Cultural Heritage" Heritage Workshop, Privernum, Italy, June 19, 2016.

"Development in Computational Material Design- Lessons from the Roman Concrete" Material Innovations Workshop, Pompeii, Italy, June 23, 2016.

Plenary Keynote: "Towards Inexpensive, Durable, Easy-to-Pour and-Cure, Functionalized Nuclear Grade Concrete, Conference on Nuclear Beyond LWRs, Cambridge, MA, November 2, 2016.

"Bio-inspired Design for Durable Concrete" Istanbul Technical University, Istanbul, Turkey, January 22, 2016.

"Sustainability of the Kuwait's Built Environment: Outreach to Scientists, Engineers, and Developers" Kuwait Foundation for the Advancement of Sciences (KFAS), Kuwait, April 25, 2016.

"Current Research and State of the Art Technologies for Bridges and Structures" Indonesian Ministry of Public Works and Housing, Bali, Indonesia, July 20, 2016.

"Developments in Materials Research – Atomistic Approaches" GRINM (General Research Institute for Non-Ferrous Materials), Beijing, China, July 22, 2016.

"Project BeeView: Measurement and Monitoring of Structure", Northeastern University, Department of Civil and Environmental Engineering, May 5, 2016.

External International Review Panel organization, workshop, presentations related to MIT-Kuwait project:18-20, January 2016.

"Multiscale modelling for sustainable and durable concrete". 1st International Conference on Construction Materials for Sustainable Future, 19-21 April, 2017, Zadar, Croatia organized by University of Zagreb. (Invited Talk, Served as the Scientific Committee member)

"Designing for resilience from atoms to structures". Workshop on Advanced technologies in structural engineering for more resilient communities, The National Academies of Sciences, Engineers, Medicine, Irvine California September 26th 2017. (Invited lecture)

"Repurposing Irradiated post-consumer plastic into concrete", Annual meeting of International Atomic Energy Agency (IAEA) on Emerging Application on Advanced Materials, December 10, 2018, Vienna, Austria. (Invited Lecture)

"Sustainability of Built Environment: A Science-based Multidisciplinary Research Partnership", The American Association for the Advancement of Science (AAAS) Annual Meeting, February 15-19, Austin, TX. (Keynote Lecture)

"Roadmap for a Sustainable Built Environment: A Science-based Multidisciplinary Research", Gulf Conference on Sustainable Built Environment, Kuwait City, Kuwait, March 10-13, 2019. (Plenary lecture)

"Transforming Waste Plastic into a performance enhancing concrete ingredient", Lafarge Holcim, Zurich, Switzerland, June 2019. (Invited Talk)

"Irradiated Waste Plastic as a Cement Additive – Perspectives on Multiscale Modeling of Cement Paste", Technical meeting of International Atomic Energy Agency (IAEA) on Recycling of Polymer Wastes by Irradiation, Vienna, Austria, September 30 – October 4, 2019. (Invited lecture)

"Advances in Structural Engineering and Concrete Materials", Conference on progress in engineering concrete structures and materials, ITU, Istanbul, February 2020. (Keynote Lecture)

"Recycling Irradiated Waste Plastic into Concrete", International Atomic Energy Agency (IAEA) October 2020, Vienna Austria (Invited talk, Virtual)

"Atomistic Investigation on the Degradation of GFRP Under Aggressive Environment", Fourth International Workshop on Sea Water Sea Sand Concrete (SSC) Structures Reinforced with FRP Composites, The Hong Kong Polytecnic University, 9-10 January 2021. (Invited presentation)

"Infrastructure Sustainability Through Sensing and Material Innovations", MITILP Symposium on Built Infrastructure, Cambridge MA, March 30, 2021. (Invited presentation)

"Advances in Structural Engineering and Materials", Bogazici University, Istanbul, Turkey, 14 April 2021. (Invited talk)

"Debonding With Moisture Effects in Multi-Materials: Application to Epoxy-Concrete Interface", Istanbul Technical University M. Inan Applied Mechanics Series, Istanbul, Turkey, June 5, 2021. (Invited talk)

"Irradiated Waste Plastic as a Concrete Additive" IAEA (International Atomic Energy Agency) NUTEC Symposium for Americas and Caribbean on recycling waste plastic using radiation techniques, Vienna Austria, 26 August 2021. (Invited talk)

- ✓ **TEACHING**
  - MIT OpenCourseWare 1.054/1.541 Mechanics and Design of Concrete Structures as taught in Spring 2004
  - MIT OpenCourseWare 1.051 Structural Engineering Design as taught in Fall 2003
  - MIT OpenCourseWare 22.314J/1.56J/2.084J Structural Mechanics in Nuclear Power Technology as taught in Fall 2006

- 1.036 Structural Mechanics and Design. New core subject (2016) for the mechanics track of the 1.ENG undergraduate degree program.
- 1.036 (Old) Structural and Geotechnical Engineering Design. Required course in the former 1-C Civil Engineering.
- 21W.781/ESD.032J Colossal Failures in Engineering. Institute-wide course freshman/sophomore special class.
- 1.52 Structural Analysis and Design
- 1.543 Advanced Bridge Design
- 1.544 Advanced Design jointly with MIT Architectural Department and Harvard School of Design emphasizing innovations in deployable structures (Principal Lecturer)
- 1.553J Analysis and Design of Offshore Structures sponsored by Sea Grant (Principal Lecturer)
- 16.29S Advances in Finite Element Methods in Structural Mechanics (Lecturer)

✓ **GRADUATE THESIS SUPERVISION**

**PH.D. STUDENTS SUPERVISED (MIT)**

- T-M Tseng, 1982 (Civil and Environmental Engineering, MIT)
- E.S. Chen, 1984 (Civil and Environmental Engineering, MIT)
- D.J.W. Wium, 1984 (Civil and Environmental Engineering, MIT)
- S. Lo, 1986 (Civil and Environmental Engineering, MIT)
- K.A. Soon, 1987 (Civil and Environmental Engineering, MIT)
- F. G. Tamer, 1989 (Civil and Environmental Engineering, MIT)
- M. Bakhoum, 1990 (Civil and Environmental Engineering, MIT)
- K.M. Lee, 1993 (Civil and Environmental Engineering, MIT)
- H.C.Rhim, 1995 (Civil and Environmental Engineering, MIT)
- B. Hearing, 2000 (Civil and Environmental Engineering, MIT)
- N.Olson, 2002 (Civil and Environmental Engineering, MIT)
- O. Gunes, 2004 (Civil and Environmental Engineering, MIT)
- W. Zhao, 2005 (Civil and Environmental Engineering, MIT)
- C. Au, 2005 (Civil and Environmental Engineering, MIT)
- E. Karaca, 2005 (Civil and Environmental Engineering, MIT)
- Tzu-Yang Yu, 2008 (Civil and Environmental Engineering, MIT)
- C. Tuakta, 2011 (Civil and Environmental Engineering, MIT)
- Denvid Lau, "Debonding a Bi-layer Material Systems under Moisture Effect: A Multiscale Approach," 2012 (Civil and Environmental Engineering, MIT)
- Justin Chen, "Video Camera-Based Vibration Measurement of Infrastructure," June 2016 (Civil and Environmental Engineering, MIT)
- Reza Mohammadi, "Intelligent Sensing of Material and Structural Systems," – October 2017, (Civil and Environmental Engineering, MIT)
- Steven Palkovic, "Atomistic and Multiscale Analysis of CSH," – October 2017, (Civil and Environmental Engineering, MIT)
- Sina Moeini Ardakani, "Atomistic Strength of Cement Paste," - (Civil and Environmental Engineering, MIT)
- Murat Uzun, - (Civil and Environmental Engineering, MIT)

- James Long, "Autonomous Planning and Resource Allocation in Reconfigurable Smart Sensing Networks" – March 2019, (Civil and Environmental Engineering, MIT)
- Xu, Donghui, "Large scale bridge data management for machine learning," 2021 (Co-supervised at MIT)
- Taha, Sama, "Machine learning for concrete mix optimization for sustainability," 2021 (Civil and Environmental Eng, MIT)

**M.SC. STUDENTS SUPERVISED (MIT)**

- P. Leombruni, 1979 (Civil and Environmental Engineering, MIT)
- Y.Y. Lam, 1979 (Civil and Environmental Engineering, MIT)
- S.S. Tulga, 1979 (Civil and Environmental Engineering, MIT)
- J.L. Tassoulas, 1979 (Civil and Environmental Engineering, MIT)
- G.R. Whicher, 1979 (Civil and Environmental Engineering, MIT)
- S.D. Costello, 1980 (Civil and Environmental Engineering, MIT)
- P.J. Pike, 1980 (Civil and Environmental Engineering, MIT)
- Haghayeghi, 1981 (Civil and Environmental Engineering, MIT)
- O. Brayer, 1981 (Civil and Environmental Engineering, MIT)
- J.G. Zisman, 1982 (Civil and Environmental Engineering, MIT)
- J.J. Calvo, 1982 (Civil and Environmental Engineering, MIT)
- P.Balduman, 1983 (Civil and Environmental Engineering, MIT)
- J.I. Nemoto, 1984 (Civil and Environmental Engineering, MIT)
- M.K. Yau, 1984 (Civil and Environmental Engineering, MIT)
- N. Nakazawa, 1984 (Civil and Environmental Engineering, MIT)
- S.S. Shareef, 1984 (Civil and Environmental Engineering, MIT)
- J.J. Plaisance, 1985 (Civil and Environmental Engineering, MIT)
- R. Sacks, 1985 (Civil and Environmental Engineering, MIT)
- G. Busa, 1985 (Civil and Environmental Engineering, MIT)
- D. Shrestinian, 1985 (Civil and Environmental Engineering, MIT)
- F.S. Chehayeb, 1985 (Civil and Environmental Engineering, MIT)
- H. Hens, 1986 (Civil and Environmental Engineering, MIT)
- M. Ahdab, 1986 (Civil and Environmental Engineering, MIT)
- H. Maesaka, 1986 (Civil and Environmental Engineering, MIT)
- F. A. Kamar, 1987 (Civil and Environmental Engineering, MIT)
- P.C.H. Chi, 1987 (Civil and Environmental Engineering, MIT)
- G. Zahar, 1987 (Civil and Environmental Engineering, MIT)
- R. A. Moussa, 1987 (Civil and Environmental Engineering, MIT)
- N.T. Nguyen, 1988 (Civil and Environmental Engineering, MIT)
- A.D. Banki, 1988 (Civil and Environmental Engineering, MIT)
- Stippung, 1989 (Civil and Environmental Engineering, MIT)
- M. Beattie, 1989 (Civil and Environmental Engineering, MIT)
- S. Shin, 1990 (Civil and Environmental Engineering, MIT)
- M. Valle, 1991 (Civil and Environmental Engineering, MIT)
- Schwitter, 1991 (Civil and Environmental Engineering, MIT)
- Oumera, 1991 (Civil and Environmental Engineering, MIT)
- A.M. Ali, 1992 (Civil and Environmental Engineering, MIT)

- A.A. Shahbazker, 1993 (Civil and Environmental Engineering, MIT)
- Pandor, 1994 (Civil and Environmental Engineering, MIT)
- U. Trende, 1995 (Civil and Environmental Engineering, MIT)
- G.M. Okutan, 1995 (Civil and Environmental Engineering, MIT)
- Hearing, 1996 (Civil and Environmental Engineering, MIT)
- S. Shah, 1996 (Civil and Environmental Engineering, MIT)
- W. Vichit-Vadakan, 1997 (Civil and Environmental Engineering, MIT)
- Morin, 1997 (Civil and Environmental Engineering, MIT)
- J. Karam, 1997 (Civil and Environmental Engineering, MIT)
- O. Gunes, 1998 (Civil and Environmental Engineering, MIT)
- Chuang, 1998 (Civil and Environmental Engineering, MIT)
- Martinez, 1998 (Civil and Environmental Engineering, MIT)
- B. Ong, 1999 (Civil and Environmental Engineering, MIT)
- Ching, 2001 (Civil and Environmental Engineering, MIT)
- Karaca, 2002 (Civil and Environmental Engineering, MIT)
- J.A. Ortega, 2006 (Civil and Environmental Engineering, MIT)
- Menzin, 2006 (Civil and Environmental Engineering, MIT)
- Obatoyinbo, 2006 (Civil and Environmental Engineering, MIT)
- P.Dohenek, 2006 (Civil and Environmental Engineering, MIT)
- T.B. Denvid Lau, 2009 (Civil and Environmental Engineering, MIT)
- Timothy Emge, 2012 (Civil and Environmental Engineering, MIT)
- Justin Chen, "Detection of defects in FRP-reinforced concrete with the acoustic-laser vibrometry method," 2013 (Civil and Environmental Engineering, MIT)
- James Long, "Automated Structural Damage Detection using One-Class Machine Learning," 2014 (Civil and Environmental Engineering, MIT)
- Steven Palkovic, "Development of a Portable Scratch Test Device for Probing Strength, Ductility and Structural Distress in Metal Materials," 2014 (Civil and Environmental Engineering, MIT)
- Murat Uzun, "Video based Structural Identification using Motion Magnification," 2018 (Civil and Environmental Engineering, MIT)

✓ **CONSULTING PROJECTS**

- National Aeronautics and Space Administration Marshall Space Flight Center, Technical Consulting, Huntsville, AL, Technical Advisor, 1972 - 1974
- Westinghouse Hanford Company, Technical Consulting, Richland WA, Consultant, 1973 - 1974
- Naval Ship Research and Development Center, Technical Consulting, Bethesda, MD, Consultant, 1973
- United Engineers and Construction, Technical Consulting, Philadelphia, PA, Consultant, 1973
- Kraftwerk Union Erlangen, Technical Consulting, Erlangen, West Germany, Consultant, 1974 - 1975
- Curtiss-Wright Corporation, Technical Consulting, Wood Ridge, NJ, Consultant, 1974 - 1975
- Exxon Production Research, Technical Consulting, Houston, TX, Consultant, 1974

- Power Reactor and Nuclear Fuel Development Corp, Technical Consulting, Tokyo Japan, Consultant, 1975 - 1975
- Peabody Construction Company, Technical Consulting, Cambridge, MA, Consultant, 1977
- Babcock & Wilcox Lynchburg Research Center, Technical Consulting, Lynchburg, VA, Consultant, 1977 - 1982
- Multisystems, Inc., Technical Consulting, Cambridge, MA, Consultant, 1978 -1979
- B&M Technological Services, Inc, Technical Consulting, Boston MA, Technical Advisor, 1979 - 1981
- National University of Cordoba, Argentina, South America, Technical Consulting, Technical Advisor, 1981
- Government of Guine Bissau, South Africa (through World Bank), Technical Consulting, Consultant, 1982 - 1983
- Ford Marrin Esposito & Witmeyer, Technical Consulting, New York, NY, Consultant, 1982
- CEMCOM Research Associates Inc, Technical Consulting, Prince Frederick, MD, Consultant, 1983
- Westinghouse Corporation, Synthetic Fuel Division, Technical Consulting, Pittsburgh, PA, Consultant, 1983
- CEMTECH Laboratories, Technical Consulting, Yorktown Heights, NY, Technical Advisor, 1986 - 1988
- Asahi Company, Technical Consulting, Tokyo Japan, Consultant, 1987 - 1987
- Irsid Laboratories, Technical Consulting, Paris, France, Technical Advisor, 1988 - 1991
- Integrated Engineering Design, Inc, Technical Consulting, Cambridge, MA, Technical Advisor, 1988 - 1991
- Shimizu Corporation, Technical Consulting, Tokyo Japan, Consultant, 1988 - 1988
- Radex Austria, Technical Consulting, Radenthein, Austria, Technical Advisor, 1989 - 1991
- Amoco Production Company, Technical Consulting, Houston, TX, Consultant, 1990 - 1991
- Comalco Research & Technology, Technical Consulting, Thomastown Victoria, Australia, Consultant, 1992 -1995
- New Jersey Steel Corporation, Technical Consulting Sayreville, NJ, Consultant, 1995 - 1995
- Lazarou Enterprises Pty. Ltd, Technical Consulting Victoria, Australia, Technical Advisor, 1997 - 1998
- Barrington Business & Engineering Group, Technical Consulting Boston Ma, Consultant, 1997 - 1997
- Ditek Earthquake Engineering and Technology, Technical Consulting, Istanbul, Turkey, Technical Advisor, 2000 - 2002
- Lazarou Enterprises Pty., Ltd, Victoria, Australia, Advisor, 2000
- Alpha International, Inc, Washington DC, Advisor, 2000
- Knoor Brake US / Knoor Bremse Germany, Technical Consulting Westminster, Maryland, Consultant, 2005

- Kuwait Institute for Scientific Research, development of Sustainability Center of Building Materials, and Infrastructures, Consulting, 2011 - 2012
- State of Florida Office of Public Counsel, delamination of nuclear containment structure for Crystal River Nuclear Plant Unit 3, Consultant, 2011 - 2012
- McDonough, Hacking, and Lavoie LLC, Boston MA, Consulting, 2015
- Florida International University Pedestrian Bridge Collapse Investigation, Gerdau Ameristeel Corporation, Consultant, 2018

✓ **PROFESSIONAL AFFILIATIONS**

✓ -- American Society of Civil Engineers (ASCE) Fellow
- American Concrete Institute (ACI) Fellow
- ASCE-ACI Joint Committee 447, Finite Element Analysis of Reinforced Concrete Structures, (past committee vice chair, Member)
- ACI Committee 446 on Fracture (in various capacities)
- ASCE EMI Structural Health Monitoring and Control Committee, Member
- American Association for the Advancement of Science (AAAS), Member
- Bridge Dynamics and Field Committee (AFF40), FHWA, Member
- International Union of Research and Testing Lab for Materials and Structures (RILEM), Member
- Boston Society of Civil Engineers (BSCE), Member
- Transportation Research Board (TRB), Member
- American Society of Mechanical Engineering (ASME), Member
- American Society for Civil Engineers (ASCE), Member
- Society of Experimental Mechanics (SEM), Member
- American Ceramic Society (ACS), Member
- American Society of Nondestructive Testing (ASNT), Member
- International Association for Bridge and Structural Engineering (IABSE), Member
- International Institute for FRP, Construction (IIFC), Elected Member Construction (IIFC)

✓ **SELECTED MEDIA COVERAGE**

- New tools could improve the way cement seals oil wells, **Engineers Journal**, 2019
- New tools could improve the way cement seals oil wells, **MIT News**, 2019
- Cities of the future may be built with locally available volcanic ash, **MIT News**, 2018
- Cities of the future could be built with concrete made from volcanic ash, **Newsweek**, 2018
- MIT Team Discovers Roman Secret of Volcanic Concrete to Build Future Cities, **Inverse Innovation**, 2018
- MIT students fortify concrete by adding recycled plastic, **MIT News**, 2017
- Students fortify concrete by adding recycled plastic, **Science Daily**, 2017
- MIT students fortify concrete through recycled plastic, **Architect Magazine**, 2017
- Using energy-based designs to enhance earthquake hazard resistance, **MIT News**, 2017
- With new model, buildings may 'sense' internal damage, **MIT News**, 2016

- MIT researchers make buildings smart enough to 'sense' internal damage over time, **Fox News**, 2016.
- Technique to monitor building 'health' utilizes ambient vibrations, **ASCE Civil Engineering Magazine**, Issue of February 2017.
- Intelligent building may 'sense' internal damage after earthquake, **Yahoo! News**, 2016.
- Buildings of future may 'sense' internal damage after earthquake, **Earthquake News**, 2016
- Intelligent building may sense internal damage after earthquake, **The Hans India**, 2016
- With New Model, Buildings May 'Sense' Internal Damage, **Science Newsline Technology**, 2016
- The Science Looks at Smart Buildings, Really Smart Ones, **Searching For Ithaka**, 2016
- Digital Nervous System Would Let Buildings Detect Their Own Weaknesses, **Popular Mechanics**, 2016
- New smart buildings may sense internal damage in real time, **India Today**, 2016
- With new computational model, buildings may "sense" internal damage, **Tech Explorist**, 2016
- MIT researchers develop sensing system to spot structural weakness in buildings, **Construction Dive**, 2016
- MIT Monitors Building Health, **Durability + Design**, 2016
- With new model, buildings may 'sense' internal damage, **Science Daily**, 2016.
- New 'smart' buildings may sense internal damage in real time, **Business Standard** and **The Free Press Journal,** 2016.
- Intelligent building may 'sense' internal damage after earthquake, **The Economic Times Science**, 2016.
- New 'smart' buildings may sense internal damage in real time, **Business Standard**, 2016
- Future buildings could 'sense' internal damage after earthquake, says research, **India TV News**, 2016
- Intelligent building may 'sense' internal damage after earthquake, **News X**, 2016
- Designing a better built environment, **MIT ILP Institute Insider**, 2016
- Magnifying vibrations in bridges and buildings, **MIT News**, 2015
- CEE Magnifies Vibrations in Bridges and Buildings, **MIT CEE News**, 2015
- Magnifying vibrations in bridges and buildings, **Global News Connect**, 2015
- Researchers apply computer vision technique to see tiny vibrations in large structures, **Phys.org**, 2015
- A concrete solution - Insight into cement's microscopic properties may lead to stronger, more sustainable concrete, **MIT News**, 2017.
- Researchers look to nature for solutions to 'greener,' more sustainable concrete production, **American Ceramic Society**, 2016
- Finding a new formula for concrete, **MIT News**, 2016
- Finding a New Formula for Concrete, **Science News Line Physics & Chemistry**, 2016
- Finding a New Formula for Concrete, **European Coatings**, 2016
- Learning how things fall apart, **MIT News**, 2014

- Learning how things fall apart, **NSF News**, 2014
- Learning how things fall apart, **Science360 News**, 2014
- CEE's Buyukozturk receives lifetime achievement award from Swiss Federal Labs, **MIT News**, 2011

**CONTRIBUTION TO EDUCATION - SUMMARY**

Prof. Buyukozturk' s life-long philosophy of civil engineering education in mechanics, structures and materials has been to offer courses that emphasize fundamentals and behavioral knowledge, through which innovative design solutions can be developed. He believes that research is an integral part of education in which methodologies and recent advances are incorporated, and class work emphasizes open-ended learning, self-development, project activity and teamwork. Since joining MIT in 1976, he has made consistent and sustained contributions to develop and support the undergraduate education program at MIT CEE and dedicated a considerable part of his time to the development of integrated core courses for undergraduate/graduate engineering.

In recent years (2013-2018), Professor Buyukozturk has played a profound role in bringing the civil engineering education program in the Department of Civil and Environmental Engineering at MIT to within a transformative program, the so-called 1-ENG umbrella, for a strong and a flexible education. As a member of the newly formed 1-ENG department committees he led the Pierce Laboratory education (civil engineering part of the department) and accreditation activities. In this context, he has developed a new core undergraduate course on "Mechanics and Design of Structures" combining elements of mechanics of materials, structural analysis, and design in an integrated form with projects to teach students the hands-on design process from fundamentals to the final product. He has complemented this core course with an upper undergraduate/graduate elective on mechanics and design of concrete structures, which incorporates advanced topics and elements of recent research.

Prof. Buyukozturk with his initiative together with two other professors from Department of Material Science and Engineering, and Department of Aeronautics and Astronautics has developed in 1990s a university wide innovative course for incoming freshman and sophomore classes on "Colossal Failures in Engineering". This course has attracted an unexpectedly large number of students resulting in the class enrollment restriction; it has created much enthusiasm and excitement among the students who have learned root causes of signature structural failures in the history of the engineering profession. Other innovative courses developed by Prof. Buyukozturk includes the MIT OpenCourseWare teaching materials on structural mechanics and nuclear power technology, and mechanics and design (which have been translated into Chinese and other languages and used as major text material by many international universities), and design of offshore structures.

His large-scale educational leadership activities include in 1990s, as leader at MIT of ECSEL national educational coalition initiative supported by NSF and, in1980s as director of MIT-TUB (Technical University of Berlin, Germany) research and education program for nearly eight years. With these programs the objective was to develop an educational framework and new teaching methods incorporating hands-on experience in teaching and research into the curriculum.

Prof. Buyukozturk has devoted significant efforts at every stage of his career to advance the culture of diversity and inclusiveness in the engineering field. He has supervised (majority at MIT) over 30 PhD

students, 70 Master students, and over 30 undergraduate students, many of whom have developed successful careers in both academic and industrial fields. He has been motivating and nurturing freshman and undergraduate minorities for producing outstanding and innovative research results at the doctoral level which have led to several top journal publications contributed and co-authored by the undergraduates. In 2015 and 2016 two female freshmen supervised by Professor Buyukozturk have received the Institute's highest distinctive honor for undergraduate students – MIT Distinguished Freshman Award for Research.

**PROFESSIONAL SERVICE - SUMMARY**

Throughout his career as a researcher and an educator, Prof. Buyukozturk's developments have progressed in parallel with his intense professional involvement with the engineering and scientific societies. Professor Buyukozturk's life-long professional service includes active membership and committee leaderships on many professional societies and committees, such as ACI, ASCE, SEM, TRB, RILEM, IABSE, ACS, IIFC, AAAS etc., and on editorial board for prestigious journals including CBM and CACAIE. As a member and/or chair, co-chair of various engineering societies, his activities, especially during the times of fundamental original developments in finite element analysis, fracture mechanics, interface mechanics, creep and shrinkage analysis of structures have been translated into major engineering society publications. Some examples are the ASCE (American Society of Civil Engineers) special publication of "Finite element analysis of reinforced concrete", a 546 page book which represented the first formal publication on the topic in 1982; "Creep analysis of structures", "Finite element analysis of creep and shrinkage" and "Probabilistic models in mathematical modeling of creep and shrinkage of concrete" published by Wiley in 1988; "Fracture mechanics parameters influencing the mechanical properties of composites" in Advanced Technology for Design and Fabrication of Composite Materials and Structures, Kluwer Academic Publishers, 1995; "Interface Fracture and Bond" in ACI edited book, 1995. He has chaired several major international conferences, one of which is the international conference on "Nondestructive testing of Materials and Structures (NDTMS-2011)" in Istanbul, Turkey that led to his edited book published by Springer as two volume RILEM book series of 1278 pages. This book was recognized as one of the most sold and cited volume of the series. It has become a major reference in profession. He has also organized and co-chaired a major "International Conference on Understanding Corrosion Mechanisms to Improve Infrastructure Durability" at MIT in 1997.

Prof. Buyukozturk has contributed to the profession and the society through his expertise as a consultant to major engineering problems and legal cases. He has served the profession as a consultant to nearly forty major US and international engineering organizations such as NASA, Westinghouse, Navy, Shimizu, Comalco of Australia, Knoor of Germany, Power Reactor and Nuclear Fuel of Japan, Kraftwerk Union Erlangen of Germany, among many others. In all his service, he has always maintained his outstanding stature and integrity. One exemplary case is his consulting for the State of Florida Office of Public Council (OPC) on the colossal failure case of the Crystal River unit 3 (CR3) nuclear containment system in 2011. The thick pre-stressed concrete containment wall had delaminated in the middle over a certain region of the great cylinder dome system (invisible from outside) due to a modification. Public Counsel J.R. Kelly of Florida states *"…Oral was the first and only structural and material expert ever retained by the OPC. His expertise and experience in nuclear containment design and modeling, finite element modeling and analysis, fracture analysis and material analysis and his advice were the primary reason that the OPC was able to negotiate a settlement with at least $1.7 billion in direct*

*benefits to the consumers in Florida who stood to be overcharged … caused by the failed nuclear concrete structure."* (2011-2012).

At MIT, Prof. Buyukozturk has continuously devoted his efforts to strategic directions and leadership roles such as junior faculty mentorship, faculty search, graduate admissions, Ph.D. program development and held various sustained capacities such as, admissions officer, doctoral program officer, member of graduate and undergraduate committees, faculty search committee chair and members and as a leader in various departmental and institutional initiatives such as, founding member of NEET (New Engineering Education Transformation) 2017-2018. In 1990s and early 2000s he was the Head of the Materials and Structures group as an academic unit of the department at that time. He also served as the director of the department's structures and materials testing laboratories. As an active participant in the MIT Industrial Liason Program (ILP) he has initiated and pursued collaborations with outstanding world class professional institutions, research laboratories and companies. In 1980s and beginning of 1990s he formed an industrial consortium with participation of 13 large international companies from oil refinery, steel, aluminum, glass, etc., industries with multiple million-dollar investments on the development of thermomechanical analysis and design of refractory linings. Prof. Buyukozturk has received the lifetime achievement award from Swiss Federal Research Laboratory (EMPA) in 2011 for "*most valuable and sustained contributions to materials science and engineering in the domain of civil engineering, and for his outstanding research support to EMPA over the last two decades*". For his work and innovations in infrastructure engineering he has been extensively featured by MIT ILP. Over the years as a faculty representative, he visited major industry and government engineering/science institutions including those in Germany, The Netherlands, United Kingdom, Switzerland, Italy, Turkey, China, Japan, the Philippines, Singapore, Indonesia, Kuwait, Saudi Arabia, United Emirates, Australia, and New Zealand for discussing research, education, and development directions as a basis for collaborative activities.

Prof. Buyukozturk was awarded in 2018 the Distinguished Service and Leadership Award from MIT Department of Civil and Environmental Engineering to recognize his *"…outstanding departmental service and leadership contributions of a member of the CEE faculty…".* He received a citation from the President of MIT Rafael Reif in a letter dated August 27, 2018: *"…You have not only advanced the boundaries of knowledge in your field but also brought so many of our young learners and researchers along with you in your discoveries. Your importance to our MIT community cannot be overstated. Thank you for advancing the MIT mission in such a sterling way."*

**SUMMARY STATEMENT**

Professor Buyukozturk in his long-distinguished career of about 45 years at M.I.T. has made sustained and pioneering contributions to advancing world-wide engineering mechanics research, computing, and practice applicable to critical problems of infrastructure resilience and sustainability. He has advanced boundaries of knowledge and made significant impacts in his field with groundbreaking innovations and outstanding scholarly leadership in research, education, and professional service. With his impactful work he has enhanced engineering literature and practice, and educated and mentored outstanding academicians and professionals for the world.