

## Curriculum Vitae

Professor of Civil Engineering  
University of Colorado at Boulder

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After completing his undergraduate Dipl.-Ing. degree at the Technical University of Vienna, Austria, in 1964, Mr. Willam continued his studies with graduate work at California State University San Jose and at the University of California Berkeley. In 1969 he received his Ph.D. degree with a dissertation on '*Finite Element Analysis of Cellular Structures*'. Upon returning to Europe in 1970, he directed a large-scale R&D project at the University of Stuttgart to develop the 3-dim finite element code SMART for the analysis and design of prestressed concrete reactor vessels. This provided an opportunity to focus on computational aspects of thermomechanical analysis of materials and structures. In 1980 he was promoted to Universitätsdozent for Structural Mechanics in Aeronautical and Aerospace Engineering with a habilitation thesis on '*Finite Element Discretization of Quasistatic Problems in Space and Time*'. In 1981 he was appointed Professor of Civil Engineering at the University of Colorado Boulder, where he was and is still teaching a variety of undergraduate and graduate courses in structural mechanics and materials. In 1988 he accepted the responsibility to chair the Institute of Mechanics at the University of Karlsruhe, Germany, from which he resigned in 1990 to return to CU-Boulder. He has directed major research projects on triaxial material models and localized failure analysis with the support of the NSF, AFOSR, WES, DFG, FHWA and CASI. Among other awards, he is the recipient of the prestigious Nathan M. Newmark Medal of ASCE [2003], the Research Award of the Alexander von Humboldt Foundation, Germany [1998], and the Science Award of the Japan Society for the Promotion of Science, Japan [1992]. Among other awards, he is the recipient of the Nathan M. Newmark Medal of ASCE (2003) and the Alexander von Humboldt Research Award (1998). In 2004 he was inducted to the National Academy of Engineering (NAE Class of 2004).

Mr. Willam is a Fellow of ASCE, ASME and USACM and a member of several committees on computational mechanics and nonlinear and inelastic material behavior. From 1994-2000 he chaired the ASCE/ACI 447 Committee on *Finite Element Analysis of Reinforced Concrete Structures*. He is a member of the editorial board of several international journals and the author of more than 160 publications, and over 140 invited lectures and presentations at professional meetings. He has organized sessions and symposia at the annual conventions of ASCE, ACI, ASME and USACM. Over the past 25 years, he was involved in developing a number of workshops and panels at international conferences. Recently he was instrumental in hosting USNCCM99, the 5th National Congress for Computational Mechanics, at the University of Colorado Boulder, August 4-6, 1999, convening 700 participants from 27 countries. Recently he chaired the Local Organizing Committee of the Fifth International Conference on Fracture Mechanics of Concrete and Concrete Structures, FraMCoS-5, April 12-16, 2004 in Vail Colorado.

The summary below lists his technical accomplishments :

## Professional Experience

- Professor of Civil Engineering, University of Colorado Boulder, 1981 - present.
- Professor and Chair of the Institute for Mechanics, University of Karlsruhe, Germany, 1988 - 1990.
- University Docent for Structural Mechanics, Department of Aeronautical & Aerospace Engineering, University of Stuttgart, Germany, 1980 - 1981.
- Group Leader at the Institute for Statics and Dynamics, University of Stuttgart, Germany, 1970 - 1981.
- Research Assistant and Research Associate in Structural Engineering and Structural Mechanics, University of California Berkeley, 1967 - 1970.
- Teaching Assistant in Structural Engineering and Structural Mechanics, University of California Berkeley, 1966 - 1967.
- Part-Time Instructor, California State University San Jose, 1964-1966.

## Education

- Dr.-Ing. habil. degree, 1980, University of Stuttgart, Germany (Prof. John H. Argyris).  
Habilitation: Finite Element Discretization of Quasistatic Problems in Space and Time (in german).
- Ph.D. degree, 1969, University of California Berkeley, California (Prof. Alex S. Scordelis).  
Dissertation: Finite Element Analysis of Cellular Structures.
- M.S. degree, 1966, California State University San Jose, California (Prof. William Lorell).  
M.S. Thesis: An Experimental Study of Combined Torsion and Bending in Reinforced Concrete Beams.
- Dipl.-Ing. degree, 1964, Technical University Vienna, Austria.

## Honors and Awards

- Member of the National Academy of Engineering (NAE Class of 2004).
- Nathan M. Newmark Medal Fellow of the American Society of Civil Engineers, ASCE, 2003.
- Fellow of the American Society of Civil Engineers, F. ASCE, 2001.
- Fellow of the American Society of Mechanical Engineers, F. ASME, 1999.
- AvH Fellow, Alexander von Humboldt Research Award, Bonn, Germany, 1998.

- Distinguished Achievement Award, CEAE-Department, University of Colorado Boulder, 1996.
- Fellow of the US-Association of Computational Mechanics, F. USACM, 1995.
- JSPS-Fellow, Japanese Society for the Promotion of Science, Tokyo, 1992.
- Research Development Award, CEAE-Department, University of Colorado Boulder, 1986.
- Fulbright Travel Award, US-Fulbright Commission, Vienna, 1964.

## Special Appointments

- June 1975, NTH-Trondheim Norway: Visiting Lecturer  
Lecture series on Finite Element Analysis of Inelastic Material Behavior.
- March 1980, NWU-Xian, China: Visiting Lecturer  
Lecture series on Finite Element Method: Theory and Applications.
- May 1985, Nanjing IT, China: Visiting Professor  
Lecture series on Finite Element Analysis of Structural Failure.
- July 1992, Nagoya University, JSPS Fellow, Japan: Visiting Professor  
Lecture series on Failure Mechanics of Quasi-Brittle Materials.
- June 1993, PIM-Milano, Italy: Visiting Professor  
Lecture series on Failure Mechanics, Challenges and Open Issues.
- July 1995, University of Stuttgart, Germany: Visiting Professor  
Lecture series on Failure Analysis of Dissipative Materials.
- June 1997, TU-Vienna, Austria: Visiting Professor  
Lecture series on Plasticity and Elastic Degradation.
- June 1998, UPC Barcelona, Spain: Visiting Professor  
Short Course on Failure Mechanics of Materials and Structures.
- Fall 1998, University of Stuttgart, AvH Fellow Germany: Sabbatical Visitor  
Lecture series on Elastoplastic Failure Analysis.
- June 2001, University of Stuttgart, AvH Fellow, Germany: Visiting Professor  
Lecture on Thermal Degradation of Heterogeneous Materials.
- June 2006, UPC Barcelona, Spain: Visiting Professor  
Short Course on Thermal Stress Analysis of Concrete and Geomaterials.
- Fall 2006, UPC Barcelona, Spain: Sabbatical Visitor  
Lectures on Computational Plasticity.

## Research Interests

- Computational Failure Mechanics, Finite Element Analysis, Interface Modeling.
- Mechanics of Materials, Plasticity, Elastic Damage, Poromechanics, Thermohydrmechanics.
- Localization Analysis of Cohesive-Frictional Materials, Thermal Degradation of Concrete Materials, Seismic Response of Masonry Infill Walls.

## Scientific and Professional Societies

- National Academy of Engineering, NAE
- American Society of Civil Engineering, ASCE
- American Society of Mechanical Engineers, ASME
- American Concrete Institute, ACI
- Gesellschaft für Angewandte Mathematik und Mechanik, GAMM
- American Academy of Mechanics, AAM
- US Association of Computational Mechanics, USACM
- Intl. Association for Fracture Mechanics of Concrete Materials and Structures, IAFraMCoS

## Professional Committees

- ASCE-EMD: Committee for Inelastic Behavior, Member
- ASCE-ACI 447: Finite Element Analysis of Reinforced Concrete Structures, Member
- ASME-AMD/MD: Joint Committee on Constitutive Equations, Member
- ASME-AMD: Committee on Computing in Applied Mechanics, Member
- USACM: Committee on Computing in Applied Mechanics, Executive Committee Member

## Editorial Board Member of International Journals

- Advisory Editor, Computer Methods in Applied Mechanics and Engineering, Elsevier Science S.A., Amsterdam.
- Editorial Advisory Board, Engineering Computations, Intl. J. for Computer-Aided Engineering and Software, MCB University Press Ltd, Bradford, England.
- Editorial Board, Numerical and Analytical Methods in Geomechanics, Incorporating Mechanics of Cohesive-Frictional Materials, John Wiley & Sons, Chichester, U.K.

## Conference Proceedings Edited

- FENOMECH I: First Intl. Conf. on Finite Elements in Nonlinear Mechanics, Aug. 28- Sept. 1, 1978, Stuttgart, (K.S. Pister, R.R. Reynolds and K. Willam, eds.), North-Holland, Amsterdam 1979.
- ASME-WAM'84, AMD-Symposium on Constitutive Equations, Micro, Macro- and Computational Aspects, Dec. 9-13, 1984, New Orleans, (K. Willam ed.), ASME-AMD Vol. G00274, New York, 1984.
- ASME-WAM'87, AMD-Symposium on Advances in Inelastic Analysis, (with N. Rebelo and S. Nakazawa), Dec. 12-16, 1987, Boston, (S. Nakazawa, N. Rebelo and K. Willam, eds.), ASME-AMD Vol. 88, New York, 1987.
- WCCM II-World Congress for Computational Mechanics, Symposium on Computational Failure Mechanics, Aug. 27-31, 1990, University of Stuttgart, Special Volume of Comp. Meth. Appl. Mech. Engng. ( Guest Editor), North-Holland, Amsterdam, Vol. 90, 1991.
- USNCCM99-5th US National Congress on Computational Mechanics, Book of Abstracts (A. Carosio, P. Smolarkiewicz, J. Yang and K. Willam, eds.), University of Colorado, Boulder Aug. 4-6, 1999.
- 5th US National Congress on Computational Mechanics, Plenary and Selected Keynote Lectures, (K. Willam and S. Sture, Guest Editors), Special Volume of Intl. J. Num. Meth. Engrg., Vol. 52 Number 1-2, 10-20 September 2001.
- ACI Special Publication SP-205, "Finite Element Analysis of Reinforced Concrete Structures", American Concrete Institute, Farmington Hills, MI (K. Willam and T. Tanabe, eds.), 2001, p. 399.
- FraMCoS-5 Proceedings, Vol. 1 and 2, "Fracture Mechanics of Concrete Structures", American Concrete Institute, Farmington Hills, MI (V.C. Li, C.K.Y. Leung, K.J. Willam and S. Billington, eds.), 2004, p. 1195.
- Special Issue on "Computational Modelling of Concrete", Computer Methods in Applied Mechanics and Engineering, Jirasek, M. Carol, I. and Willam, K., (eds.), (2006), Vol. 195, Issue 52.
- Special Issue on "Fracture of Concrete Materials and Structures", Intl. J. Engineering Fracture Mechanics, Leung, C.K.Y. and Willam, K., (eds.), (2007), Vol. 74., Issues 1-2.

## Symposia and International Conferences Organized

- FENOMECH I: First Intl. Conference on Finite Elements in Nonlinear Mechanics, Aug. 28- Sept. 1, 1978, University of Stuttgart, Germany.
- ASME-WAM'84, AMD-Symposium on Constitutive Equations, Micro, Macro- and Computational Aspects, Dec 9-13, 1984, New Orleans.
- ASME-WAM'87, AMD-Symposium on Advances in Inelastic Analysis, (with N. Rebelo and S. Nakazawa), Dec. 12-16, 1987, Boston.
- ACI Spring Convention 1995, Finite Element Analysis of Concrete Structures, 2 sessions (with St. McCabe), Salt Lake City, March 5-8, 1995.

- ASCE Engineering Mechanics Specialty Conference, Finite Element Analysis of Concrete Structures, 2 sessions (with G. Pijaudier-Cabot), University of Colorado, Boulder, May 22-24, 1995.
- US Congress for Computational Mechanics, 3rd USNCCM 1995, Simo Symposium - 6 sessions (with R. Owen and E. Onate), Dallas, June 12-14, 1995. Intl. J. Solids & Structures, in Memory of Professor Juan Carlos Simo (M. Ortiz and K. Willam, Guest Editors), Pergamon, Elsevier Science Ltd, August 1996, Vol. 33, No. 20-22.
- FRAMCOS-2, Fracture Mechanics in Concrete Structures, ETHZ Zurich, Panel Workshop on Discrete versus Smeared Crack Analysis, (with I. Carol), Zurich, July 22-24, 1995.
- ASME-IMECE'97, Symposium on Failure Predictions in Dynamic Environments, 4 sessions (with H. Levine and G. Voyiadjis), Nov. 16-21, 1997, Dallas.
- ASCE 1999 Structures Congress, Symposium on "Concrete: From Material Modeling to Structural Design", 4 sessions (with E. Spacone, B. Shing, G. Meschke and F.-J. Ulm), New Orleans, April 19-21, 1999.
- USNCCM99, 5th US National Congress on Computational Mechanics, (with C. Farhat, C. Felippa, K.C. Park and S. Sture), University of Colorado, Boulder, August 4-6, 1999.
- ACI Fall Convention 2000, Three Session Symposium on "Finite Element Analysis of Reinforced Concrete Structures", Toronto, October 15-20, 2000, (K. Willam and T. Tanabe, eds.), 2001.
- FraMCoS-5, "Fracture Mechanics of Concrete Structures", Vail Colorado, April 12-16, 2004, (V.C. Li and K.J. Willam), 2004.

## Major Research Projects

- AFOSR: Finite Elements and Localized Failure, Bolling AFB, 1982-1985.
- NSF: Multiaxial Material Formulations for Finite Element Analysis of Plain and Reinforced Concrete Structures, Washington D.C., 1984-1987.
- WES: Constitutive Driver for Triaxial Response Behavior of Plain Concrete, Vicksburg MS, 1985-1987.
- NSF: Progressive Failure Simulations in Solids and Structures, Washington D.C., 1988-1990.
- AFOSR: Brittle-Ductile Failure Mechanics of Concrete and Mortar, Bolling AFB, 1987-1989.
- DFG: Numerische Ansätze zur Lokalisierung von Versagensvorgängen, Bonn, 1989-1993.
- NSF: Computational Failure Mechanics of Solids and Structures, Washington D.C., 1991-1994.
- AFOSR: Regularization of Structural Degradation Processes, Bolling AFB, 1992-1995.
- NSF: Dynamic Stability of Structural Degradation, Washington D.C., 1992-1996.
- FHWA: Finite Element Models of Roadside Safety Structures, Washington D.C., 1994-1997.
- AFOSR: Failure Mechanics of Cohesive-Frictional Materials, Bolling AFB, 1996-1997.

- NSF: Ultrasonic Assessment of Damage in Concrete Materials, Washington D.C., 1996-1999.
- NSF: Performance of Reinforced Concrete Bridge Piers during the 1995 Kobe Earthquake, Washington D.C., 1996-1999 (B. Shing PI, K. Willam Co-PI, and E. Spacone Co-PI).
- AFOSR: Dynamic Performance Evaluation of Conventional and Non-Conventional Concrete, Bolling AFB, 1997-1998 (K. Willam PI, L. Bond Co-PI, and Y. Xi Co-PI).
- NSF: Accelerated Testing and Modeling of Concrete Durability, Washington D.C., 1998-2001 (Y. Xi PI, K. Willam Co-PI, and D. Frangopol, Co-PI).
- CASI: Ultrasonic Damage Simulation in Engineering Materials, CSU-Fort Collins, 1998-2000 (K. Willam PI).
- NSF: Simulation Platform for the Earthquake Response of Reinforced Concrete Structures, (K. Willam PI, X-Y. Cai, Co-PI, C. Farhat, Co-PI, B. Shing, Co-PI), 2000-2003.
- NSF: An Internet-Based Meta-Model Driven Distributed Workbench for MBS, (C. Farhat, PI, G. Hearn, Co-PI, D. Lesoinne, Co-PI, K. Willam Co-PI), 2000-2002.
- NSF: High Temperature Effects on Concrete Materials: A Multiscale Approach, (K. Willam, PI, Y. Xi, Co-PI), 2004-2007.
- NEESR SG: Seismic Performance Assessment of Retrofit of Non-ductile RC Frames with Infill Walls (K. Willam, PI, S. Metupalayam, Co-PI), 2005-2009.

## Consulting Experience

- R. Kaiser Eng.: Dynamic Failure of Mining Chute, Denver 1983.
- Synthes Inc.: Thermal Stress Analysis of Turning Fixture, Monument, 1985.
- Failure Analysis Associates: Composite Model for Finite Element Analysis of Reinforced Concrete, Palo Alto, 1986.
- Shell Development Co.: Failure Study of Threaded Connections, Houston, 1984 and 1987.
- GA-Technologies Inc.: Triaxial Constitutive Formulations for Concrete, San Diego, 1987 and 1988.
- Shell Development Co.: Failure Study of Threaded Connections, Houston, 1992 and 1993.
- Hibbit, Karlsson & Sorensen, Inc.: Constitutive Aspects of Concrete Materials, Pawtucket, 1994.
- Amoco Co.: Constitutive Modeling of Rock and Concrete, Tulsa, 1995.
- Hilti Inc.: Characterization of Concrete Materials, Liechtenstein, 1998.
- NIST: Outside Expert of WTC Investigation of Twin Tower Collapse, Gaithersburg, 2003-2004.
- Sandia NL: Thermal Effects on Structures Exposed to Fire, 2004-2005.

## Scholarly Work

In the last five years Dr. Willam has directed several research projects on failure mechanics, localization analysis, damage mechanics of cohesive/frictional materials and their ultrasonic detection, thermal degradation of heterogeneous concrete materials, cohesive interface models, thermohydrmechanics and failure of masonry infill walls.

He has authored and co-authored more than 160 papers in refereed journals and conference proceedings, and presented over 140 invited lectures and papers at professional meetings.

## Teaching Experience

- Undergraduate Level:

- CVEN 2121: Analytical Mechanics I, Statics - Lecture Notes
- CVEN 3111: Analytical Mechanics II, Dynamics
- CVEN 3161: Mechanics of Materials I - Lecture Notes
- CVEN 4161: Mechanics of Materials II - Lecture Notes
- CVEN 3505: Structural Analysis
- CVEN 4525: Matrix Structural Analysis

- Graduate Level:

- CVEN 5161: Advanced Mechanics of Materials I - Lecture Notes
- CVEN 6161: Advanced Mechanics of Materials II
- CVEN 6525: Finite Element Analysis of Structures - Lecture Notes
- CVEN 6831: Special Topics in Plasticity and Elastic Degradation
- CVEN 7111: Dynamics of Structures
- CVEN 7141: Plates and Shells - Lecture Notes
- CVEN 7511: Computational Mechanics of Solids and Structures - Lecture Notes
- CVEN 7831: Special Topics in Solid Mechanics

## Doctoral Students and Theses Supervised

- Vaz, Luiz E. (U-Stuttgart, 1981)  
Nichtlineare Instationäre Analyse mit der Methode der Finiten Elemente  
Prof., PUC-University, Rio de Janeiro, Brasil.
- Al-Ghamedy, Hamdan N. (CU-Boulder, 1986)  
Nonlinear Finite Element Analysis of Inelastic Structures with Applications to Reinforced Concrete  
Prof., King Saud University, Dhahran, Saudi Arabia.
- Sobh, Nahil A. (CU-Boulder, 1987)  
Bifurcation Analysis of Tangential Material Operators  
Assoc. Res. Prof., University of Illinois, Urbana Champaign.
- Pramono, Eddy (CU-Boulder, 1988)  
Numerical Simulation of Distributed and Localized Failure in Concrete  
Senior Architect, Cadence Design Inc., San Jose, California.



- Sabban, Sahl A. (CU-Boulder, 1989)  
Property Analysis and Incremental Formulation of  $J_2$  Elasto-Plastic Solids in Plane Stress  
Chair of Civil Eng., University of Mekah, Saudi Arabia.
- Grosserode, Patrick J. (CU-Boulder, 1991)  
Computational Structural Dynamics for Systems with Chaotic Motions  
Senior Staff Member, Orbital Sciences, Chandler, Arizona.
- Steinmann, Paul (U-Karlsruhe, 1992)  
Lokalisierungsprobleme in der Plasto-Mechanik  
Chaired Prof. of Mechanics, University of Kaiserslautern, Germany.
- Etse, Guillermo (U-Karlsruhe, 1992)  
Theoretische und numerische Untersuchung zum diffusen und lokalisierten Versagen in Beton  
Assoc. Prof., University of Tucuman, Argentina.
- Dietsche, Andreas (U-Karlsruhe, 1993)  
Lokale Effekte in linear-elastischen und elasto-plastischen Cosserat-Kontinua  
Res. Assoc., BMW AG, Munich, Germany.
- Iordache, Maria-Magdalena (CU-Boulder, 1996)  
Failure Analysis of Classical and Micropolar Elastoplastic Materials  
Res. Assoc., Emerging Technologies, IBM Life Sciences Solutions, Somers, NY.
- Münz, Thomas (CU-Boulder, 1997)  
Algorithmic Formulations and Failure Characteristics in Large Strain Plasticity and Viscoplasticity  
Res. Engineer, DYNAmore, Stuttgart-Echterdingen, Germany.
- Kang, Hong Duk (CU-Boulder, 1997)  
Triaxial Concrete Model for Plain and Reinforced Concrete Behavior  
Consultant Engineer, ARO-Aberdeen MD.
- Radaković-Guzina, Zorica (CU-Boulder, 1998)  
Ultrasonic Assessment of Damage in Concrete under Axial Loads  
Res. Assoc., Itasca Consulting Group, Minneapolis, MN.
- Nogueira, Carnot L. (CU-Boulder, 2000)  
Ultrasonic Wave Propagation in Two-Phase Composite Materials and Characterization of Mechanical  
Damage in Concrete  
Civil Engineer at Accounting Court of Pernambuco, Brazil.
- Hansen, Eric J. (CU-Boulder, 2000)  
A two-surface anisotropic damage/plasticity model for plain concrete  
Research Engineer, Weidlinger Assoc., Palo Alto, CA.
- Häussler-Combe, U., (U-Karlsruhe, 2001)  
Elementfreie Galerkin-Verfahren  
Grundlagen und Einsatzmöglichkeiten zur Berechnung von Stahlbetontragwerken  
Habilitation, Ass. Prof., Technical University Dresden, Germany

- Pivonka, Peter (TU-Vienna, 2002)  
Constitutive Modeling of Triaxially Loaded Concrete Considering Large Compressive Stresses: Application to Pull-Out Tests of Anchor Bolts  
Post Doctoral Fellow ARRC, Australian Geodynamics Research Center, Perth, Australia.
- Hörmann, Matthias (U-Stuttgart, 2002)  
Nichtlineare Versagensanalyse von Faserverbundstrukturen  
Research Engineer, CADFEM GmbH, Munich.
- Lee Janghong (CU Boulder, 2003)  
Aerodynamic Simulation of the Bronx-Whitestone Suspension Bridge using Computational Fluid Dynamics  
Consulting Engineer, Seoul Korea.
- Rhee, Inkyu (CU Boulder, 2004)  
Cohesive Interfacial Crack Analysis of Concrete Materials and Reinforced Concrete Structures  
Research Engineer, Korean Railroad Institute, Seoul, Korea.
- Caballero, Antonio (UPC Barcelona, 2005)  
Cohesive Interfacial Crack Analysis of Concrete Materials and Reinforced Concrete Structures  
Postdoctoral Fellow, Geophysical Research Institute, Perth, Australia.
- Bongers, Hans P.W. (TU Eindhoven, 2006)  
Concrete Behaviour in Multiaxial Compression: Numerical Modelling  
Senior Structural Engineer, Betonson Inc., Eindhoven-Son, The Netherlands.

### Current Doctoral Students:

- Lee, Keun, CU-Boulder
- Blackard, Ben, CU-Boulder

### Academic Mentors

- Scordelis, A.C., Prof. em., University of California, Berkeley.
- Argyris, J.H., Prof. em., University of Stuttgart, Germany.

### Collaborators in the Last Five Years

- Carol, Ignacio, Prof., Polytechnical University of Catalonia, Barcelona, Spain.
- Rizzi, Egidio, Assoc. Prof., Polytechnical University of Bergamo, Italy.
- Tanabe, Tada-aki, Prof., Nagoya University, Nagoya, Japan.
- Maier, Giulio, Prof., Politecnico di Milano, Italy.
- Etse, Guillermo, Prof., National University of Tucuman, Argentina.
- Steinmann, Paul, Prof., University of Kaiserslautern, Germany.