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Personal Data

Married (three children)
English, French, Italian, Spanish, Arabic
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December 28, 1953 Bogota Colombia
4949 Sundance Square
Boulder, CO 80301

Professional Experience

- Director and Principal Investigator of the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES), NSF Center on Fast Hybrid Test at the University of Colorado, Boulder.
 - Visiting Professor, Universite de Toulouse, one month 2009.
 - Visiting Professor, Politecnico of Catalunya, one month 2007.
 - Professeur Associé, Ecole Normale Supérieure de Cachan, Cachan, France, one month 2007.
 - Visiting Professor, Politecnico of Milan, Department of Structural Engineering, 2003-2004.
 - Visiting Professor, Swiss Federal Institute of Technology (Lausanne), Material Science Department, 1997-1998.
 - Professor, Department of Civil, Environmental, and Architectural Engineering, University of Colorado, Boulder CO, 1995 - Present.
 - *Professeur Associé*, Ecole Normale Supérieure de Cachan, Cachan, France, March 1992, and 2 months 1994.
 - *Professeur Invité*, Swiss Federal Institute of Technology, Lausanne, January-June 1990.
 - Associate Professor, Department of Civil, Environmental, and Architectural Engineering, University of Colorado, Boulder CO, June 1988 - 1995.
 - Assistant Professor, Department of Civil, Environmental, and Architectural Engineering, University of Colorado, Boulder CO, Jan. 1984 - May 1988.
 - Assistant Professor, Department of Civil Engineering, University of Pittsburgh, Pittsburgh, PA, Sept. 1981-Dec. 1983.
 - Research Associate, Department of Civil Engineering, Princeton University, Princeton, N.J., Oct. 1980 - Aug. 1981.
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Education

- Cornell University, Ph.D. in Civil Engineering, September 1980.

- Cornell University, M.E. in Civil Engineering, January 1977.
 - American University of Beirut, B.E. in Civil Engineering, June 1975.
 - Lycée Chateaubriand, Rome, Baccalaureat Série Scientifique, 1971.
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Research Interests

- Computational and experimental (fracture) mechanics.
 - Nonlinear dynamic analysis of structures (dams).
 - Real time hybrid simulation.
 - Modeling of concrete deterioration (Alkali Silica Reactions, Chloride Diffusion, Carbonation).
 - Large scale and innovative laboratory testing.
 - Practical application in hydroelectric, nuclear and wind energy.
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Teaching

Undergraduate:

Statics
 Strength of Material
 Structural Analysis
 Reinforced Concrete
 Computer Literacy for Undergraduates
 Matrix Structural Analysis
 Structural Analysis for Architects

Graduate:

Prestressed Concrete
 Continuum Mechanics
 Advanced Mechanics of Materials
 Finite Elements
 Fracture Mechanics
 Computer Graphics

Publications

Reviewed Journals

Fracture Mechanics; Models, Computational

14. Puatatsananon, W., Saouma, V., and Slowik, V., **Numerical Modeling of Heterogeneous Material** *Computers and Concrete*, 2008, Vol. 5, No. 3.
13. Puntel, E., Bolzon, G. Saouma, V., **A Fracture mechanics Based Model for Joints Under Cyclic Loading**, November 2006, *ASCE J. of Engineering Mechanics*, Vol. 132, No. 11, pp. 1151-1159.
12. Pham, H.B., Al-Mahaidi, R., Saouma, V., **Modelling of CFRP-Concrete Bond Using Smeared and Discrete Cracks**, *Journal of Composite Structures*, September 2006, Vol. 75, No. 1-4, pp. 145-150

11. Puatatsananon, W., Saouma, V., **Reliability Analysis in Fracture Mechanics Using the First Order Reliability Method and Monte-Carlo Simulation**, *Fatigue & Fracture of Engineering Materials and Structures*, Vol. 29, No. 11, pp. 959-975, Nov. 2006.
10. ACI Committee 446 (Including Saouma), **Report on Dynamic Fracture of Concrete**, *American Concrete Institute Report ACI 446.4R-04*, 2004.
9. Hansen, E., Saouma, V.E. **Hybrid Models for 3D Analysis of Reinforced Concrete Structures**, *Revue Francaise de Genie Civil*, Vol. 7, No. 5, pp.647–658, 2003.
8. Galvez, J.C., Cervenka, J., Cendon, D.A, Saouma, V. **A Discrete Crack Approach to Normal/Shear Cracking in Concrete**, *Cement and Concrete Research*, Vol. 32, pp. 1567-1585, 2002
7. Červenka, J., Kishen, C. and Saouma, V., **Mixed Mode Fracture of Cementitious Bimaterial interfaces; Part II: Numerical Simulation**, *Engineering Fracture Mechanics*, Vol. 60, No. 1, pp. 95-107, May 1998.
6. Saouma, V.E. Ayari, M., and Leavell, D., **Mixed Mode Crack Propagation in Homogeneous Anisotropic Body**, *Engineering Fracture Mechanics*, Vol. 27, No. 2, pp. 171-184, 1987.
5. Saouma, V.E., and Sikiotis, E.S., **Stress Intensity Factors in Anisotropic Bodies Using Singular Isoparametric Elements**, *Engineering Fracture Mechanics*, Vol. 25, No. 1, pp. 115-121, 1986.
4. Ingraffea, A.R., Gerstle, W.H. Gergely, P., and Saouma, V.E., **Fracture Mechanics of Bond in Reinforced Concrete**, *Journal of Structural Engineering, ASCE*, Vol. 110, ST4, pp. 871-890, 1984
3. Saouma, V.E., and Zatz, I.J., **An Automated Finite Element Procedure for Fatigue Crack Propagation Analysis**, *Engineering Fracture Mechanics*, Vol. 20, No. 2, pp. 321-333, 1984.
2. Saouma, V.E., and Schwemmer, D., **Numerical Evaluation of the Quarter Point Singular Element**, *International Journal of Numerical Methods in Engineering* Vol. 20, pp. 1629-1641, 1984.
1. Saouma, V.E., Ingraffea, A.R., and Catalano, D., **Fracture Toughness of Concrete; K_{ic} Revisited**, *Journal of the Engineering Mechanics Division, ASCE*, Vol. 108, No. EM6, pp. 1152-1166, 1982.

Fracture Mechanics; Experimental

16. Tussiwand, S., Saouma, V., Terzenbach, R., De Luca, L.Y. **Fracture Mechanics of a Solid Rocket Motor Propellant Grains: Material Testing**, *AIAA Journal of Propulsion and Power*, Vo. 25, No. 1, Jan-Feb 2009, pp. 60-73
15. Puntel, E., Saouma, V., **Experimental Behavior of Concrete Joints Under Cyclic Loading**, *ASCE J. of Structural Engineering*, VOL. 134, No. 9, September 2008, pp. 1558-1568.
14. Saouma, V., deSanctis, F., Denarié, E., Vigiani, C., **Nonlinear Fracture Mechanics Testing of Rock; Application to Fine Grained Tuff**, Submitted to *International Journal of Rock Mechanics and Mining Science*, Apr. 2005.

13. Chandra, K. and Saouma, V., **Fracture of Rock-Concrete Interfaces: Laboratory Tests and Applications**, *ACI Structural Journal*, Vol. 101, No. 3, May-June 2004
12. Denarié, E., Saouma, V., Iocco, A. and Varelas, D., **Concrete Fracture Process Zone Characterization with Fiber Optics**, *ASCE J. of Eng. Mechanics*, Vol. 127, No. 5, May 2001, pp. 494-502.
11. Slowik, V. and Saouma, V. **Water Pressures in Propagating Concrete Cracks**, *ASCE J. of Structural Division*, Vol. 126, No.2, pp. 235-242, Feb, 2000
10. Slowik, V., Kishen, C. and Saouma, V., **Mixed Mode Fracture of Cementitious Bi-material interfaces; Part I: Experimental Results**, *Engineering Fracture Mechanics*, Vol 60, No. 1, pp. 83-94, May 1998.
9. Slowik, V., and Saouma, V.E., **Large Scale Direct Tension Test of Concrete** *Cement and Concrete Research*, Vol. 26, No. 6, pp. 949-954, 1996.
8. Slowik, V., Plizzari, G., and Saouma, V.E., **Fracture of Concrete Under Variable Amplitude Fatigue Loading**, *ACI Materials Journal*, Vol. 93, No. 3, pp. 272-283, May-June 1996.
7. Brühwiler, E., and Saouma, V.E., **Water Fracture Interaction in Cracked Concrete; I Fracture Properties**, *ACI Materials Journal* Vol. 92, No. 3, pp. 296-303, 1995
6. Brühwiler, E., and Saouma, V.E., **Water Fracture Interaction in Cracked Concrete; II Hydrostatic Pressure in Cracks**, *ACI Materials Journal*. Vol. 92, No. 4, pp. 383-390, 1995
5. Saouma, V.E., Broz, J., and Boggs, H.L., **Effect of Aggregate and Specimen Size on Fracture Properties of Dam Concrete**, *ASCE Journal of Materials in Civil Engineering*, Vol. 3, No. 3, pp. 204-218, Aug. 1991.
4. Broz, J., Saouma, V.E., Brühwiler, E., and Boggs, H., **Fracture Mechanics Experiments in a Centrifuge**, *Centrifuge-91*, pp. 575-582, Balkema, 1991.
3. Slowik, V. and Saouma, V. **Water Pressures in Propagating Concrete Cracks**, *ASCE J. of Structural Division*, Vol. 126, No.2, pp. 235-242, Feb, 2000
2. Brühwiler, E., and Saouma, V.E., **Water Fracture Interaction in Cracked Concrete; I Fracture Properties**, *ACI Materials Journal* Vol. 92, No. 3, pp. 296-303, 1995
1. Brühwiler, E., and Saouma, V.E., **Water Fracture Interaction in Cracked Concrete; II Hydrostatic Pressure in Cracks**, *ACI Materials Journal*. Vol. 92, No. 4, pp. 383-390, 1995

Fractals and Size Effects

5. Saouma, V., Fava, G., **On Fractals and Size Effects**, *International Journal of Fracture Mechanics; Special Issue Prof. Bazant's 70th Birthday*, Vol. 137, No. 1-4, pp. 231-249, Jan. 2006.
4. Saouma, V. Natekar, D. and Sbaizero, O. **Nonlinear Finite Element Analysis and Size Effect Study of a Metal-Reinforced Ceramics-Composite**, *Materials Science and Engineering A*, A323, pp. 129-137, 2002.
3. Saouma, V.E. and Natekar, D., **Cohesive Stresses and Size Effect in Quasi-Brittle Material**, Sadhana, *Journal of the Indian Academy of Sciences*, Bangalore, Vol. 27, No. 126, Aug. 2002, pp. 461-466.

2. Saouma, V.E., and Barton, C., **Fractals, Fractures and Size Effects in Concrete**, *ASCE J. of Engineering Mechanics*, Vol. 120, No. 4, April 1994.
1. Saouma, V.E., Barton, C., and Gamal-El-Din, N., **Fractal Characterization of Fracture Surfaces in Concrete**, *Engineering Fracture Mechanics Journal*, Vol. 35, No. 1, 1990.

Dam Engineering

22. Lebon, G., Saouma, V., Uchita, Y. **Rock-Structure Interaction for Massive Concrete Structures; Part II; Modeling**, submitted to *Earthquake Spectra*, 2009.
21. Saouma, V., Miura, F., Lebon, G. Yagome, Y. **Rock-Structure Interaction for Massive Concrete Structures; Part I Model**, submitted to *Earthquake Spectra*, 2009.
20. Uchita, Y., Noguchi, Y. and Saouma, V. **Seismic Dam Safety Research** *International Water Power & Dam Construction*, pp. 16-22, Dec. 2005.
19. Saouma, V.E., Uchita, Y., Gillan, C., Shimpo, T., **Centrifuge Tests of Concrete Gravity Dams Subjected to Hydrostatic and Uplift Forces**, *International Water Power & Dam Construction*, July 2005, pp. 38-41
18. Saouma, V.E. **Reliability Based Nonlinear Fracture Mechanics Analysis of a Dam**, *Dam Engineering* Vol. 16, No. 3, pp. 219-241, Nov. 2005.
17. Uchita, Y., Shimpo, T., Saouma, V., **Dynamic Centrifuge Tetsts of Concrete Dams**, *Earthquake Engineering and Structural Dynamics*, Vol. 34, pp. 1467-1487, Oct. 2005.
16. Saouma, V., Natekar, D. and Hansen, E., **Cohesive Stresses and Size Effects in Elasto-Plastic and Quasi-Brittle Materials**, *International Journal of Fracture*, Vol. 119, pp. 287–298, 2003.
15. Saouma, V., Hansen, E., Rypl, D., **3D Nonlinear Analysis of an Arch Dam**, *Dam Engineering*, Vol. XIV, Issue 1, June 2003.
14. Saouma, V. and Morris, D., **Application of Fracture Mechanics to Concrete Dams; A Detailed Case Study**, to *Dam Engineering*, Vol. IX, No. 4, pp. 321-344, 1998
13. Saouma, V. and Morris, D., **Improving Concrete Dam Safety Evaluation: A Look at Recent Contributions**. *Hydro Review*, Vol. 16, No. 7, Dec. 1997, pp. 65-73
12. Saouma, V.E., Milner, D., **On Why Fracture Mechanics should be Used in Dam Safety Evaluation**, *Dam Engineering*, Vol 7, No. 3, pp. 215-231, Oct. 1996.
11. Dewey, R., Reich, R., and Saouma, V.E., **Uplift Modelling for Fracture Mechanics Analysis of Concrete Gravity Dams**, *ASCE Journal of Structural Division*, Vol. 120, No. 10, pp. 3025-3044, Oct. 1994.
10. Reich, R., Saouma, V. and Chasten, C., **Mississippi River: Dam 27 by Pass Canal. Fracture Mechanics Based Analysis of a Gravity Lock Monolith**, *Int. J. of Dam Engineering*, Volume 5, No. 3, October 1994.
9. Plizzari, G., Waggoner, F. and Saouma, V., **Centrifuge Modeling and Analysis of Concrete Gravity Dams**, *ASCE Journal of Structural Engineering*, Vol. 121, No. 10, pp. 1471-1479, Oct. 1995.
8. Waggoner, F., Plizzari, G. and Saouma, V., **Centrifuge Tests of Concrete Gravity Dams**, *Int. J. of Dam Engineering*, Vo. IV, No. 3, pp. 145-171, 1993.
7. Saouma, V.E., Broz, J., and Boggs, H.L., Brühwiler, E., **In-situ Field Testing for Frac-**

- ture Properties of Dam Concrete**, *ASCE Journal of Materials in Civil Engineering*, Vol. 3, No. 3, pp. 219-234, Aug. 1991.
6. Brühwiler, E., Broz, J., and Saouma, V.E., **Fracture Model Evaluation of Dam Concrete**, *ASCE Journal of Materials in Civil Engineering*, Vol. 3, No. 4, pp. 235-251, Oct. 1991.
 5. Ayari, M.L., and Saouma, V.E. **Static and Dynamic Contact/Impact Problems Using Fictitious Forces**, *International Journal for Numerical Methods in Engineering* Vol. 32, No. 3, pp. 623-644, Aug. 1991.
 4. Dungar, R., Saouma, V., Whittman, F., **Conference Report: The Application of Fracture Mechanics to Dam Engineering** *Dam Engineering*, Vol 2, No. 1, pp. 3-20, 1991.
 3. Saouma, V.E., Brühwiler, E., and Boggs, H.L., **A Review of Fracture Mechanics Applied to Concrete Dams**, *Int. J. of Dam Engineering*, Vol. 1, No. 1, pp. 41-57, Jan. 1990.
 2. Ayari, M., and Saouma, V.E., **A Fracture Mechanics Based Seismic Analysis of Cracked Concrete Gravity Dams Using Discrete Cracks**, *Engineering Fracture Mechanics Journal*, Vol. 35, No. 1, 1990.

Concrete Deterioration

7. Puatatsananon, W., Saouma, V., Xi, Y.P., **Chemo-Mechanical Coupled Numerical Model for Alkali-Silica Reaction of Concrete** Submitted to *Cement and Concrete Research* Feb. 2007.
6. Saouma, V., Perotti, L., Shimpo, T. **Stress Analysis of Concrete Structures Subjected to Alkali Aggregate Reactions**, *American Concrete Institute Structural Journal*, Vol. 104, No. 5, pp. 532-541, September-October, 2007.
5. Saouma, V. Perotti, L., **Constitutive Model for Alkali Aggregate Reactions**, *American Concrete Institute, Materials Journal*, Vol. 103, No. 3, pp. 194-202, May-June, 2006.
4. Puatatsananon, W. and Saouma, V., **Nonlinear Coupling of Carbonation and Chloride Diffusion in Concrete**, *ASCE J. of Materials Engineering*, May/June 2005, pp. 264-275.
3. Camata, G., Spacone, E., Al-Mahaidi, R. and Saouma, V., **Analysis of Test Specimens for Cohesive Near-Bond Failure of FRP-Plated Concrete**, *ASCE J. of Composites for Construction*, pp. 528-538 Vol. 8, No. 6, December 2004
2. Hansen, E. and Saouma, V., **Numerical Simulation of Reinforced Concrete Deterioration; Part II: Steel Corrosion and Concrete Cracking**, *ACI Materials Journal*, Vol. 96, No. 3, pp. , 1999.
1. Hansen, E. and Saouma, V., **Numerical Simulation of Reinforced Concrete Deterioration; Part I: Chloride Diffusion**, *ACI Materials Journal*, Vol. 96, No. 2, pp. 173-180, 1999.

Numerical Simulations

14. Saouma, V., Chang, S.Y., and Sbaizero, O., **Numerical Simulation of Thermal**

- Residual Stress in Mo- and FeAl⁻- Toughened Al₂O₃**, *Composites Part B: Engineering*, Vol. 37, pp. 550-555, 2006.
13. Saouma, V.E. and Chang, S.Y. and Sbaizero, O., **Numerical Simulation of Transformation ZrO₂- Toughened AL₂O₃**, Submitted to *European Journal of Ceramics*, Apr. 2005.
 12. Hansen, E., Saouma, V. **3 D Nonlinear Finite Element/Fracture Mechanics Analysis of a Pressurized Nuclear Reactor Container Ring**, *Nuclear Engineering and Design*, Vo. 225, pp. 1–10, 2003
 11. Saouma, V. Anderson, D., Ostrander, K., Slowik, V., **Application of Fiber Bragg Gratings in Local and Remote Infrastructure Health Monitoring**, pp. 259–266, May 1998 *Materials and Structures; RILEM*,
 10. Červenka, J. and Saouma, V., **Numerical Evaluation of 3D SIF for Arbitrary Finite Element Meshes**, *Engineering Fracture Mechanics*, Vol. 57, No. 5, July 1997, pp.541-563.
 9. Shinmura, A. and Saouma, V. **Fluid Fracture Interaction in Pressurized Reinforced Concrete Structures**, *Materials and Structures; RILEM*, Vol 30, NO. 196, March 1997, pp. 72-80.
 8. Sikiotis, E.S., Saouma, V.E., Long, M., and Rogers, W., **Finite Element Based Optimization of Complex Structures on a Cray/XMP Supercomputer**, *Computers and Structures*, Vol. 36, No. 5, pp. 901-911, 1990.
 7. Saouma, V.E., Doshi, S., and Jones, M., **Architecture of an Expert System Based Code Checker**, *Int. J. for Engineering Applications of Artificial Intelligence*, Vol. 2, PP. 49-56, 1989.
 6. Sikiotis, E.S., and Saouma, V.E., **Parallel Structural Optimization on a Network of Computer Workstations**, *Computers and Structures*, V. 29, No. 1, pp. 141-150, 1988.
 5. Jones, M., and Saouma, V.E., **A Prototype Hybrid Expert System for Structural Design**, *ASCE J. of Computing*, V. 2, No. 2, pp. 136-143, 1988.
 4. Sikiotis, E.S., and Saouma, V.E., **Optimum Design of Reinforced Concrete Frames Using Interactive Computer Graphics**, *Engineering with Computers*, V. 3, pp. 101-110, 1987.
 3. Saouma, V.E., and Sikiotis, E.S., **Interactive Graphics Nonlinear Constrained Optimization**, *Computer and Structures*, Vol. 21, No. 4, pp. 759-769, 1985.
 2. Saouma, V.E., and Sikiotis, E.S., **Computer Graphics Aided Design of Reinforced Concrete Buildings**, *Concrete International*, Vol. 7, No. 6, pp. 25-30, June 1985.
 1. Saouma, V.E., and Murad, R., **Partially Prestressed Concrete Beam Optimization**, *Journal of Structural Engineering, ASCE*, Vol, 110, ST3, pp. 589-604, 1984
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Special Reviewed Publication

12. Saouma, V.E. and Sivaselvan, M.V. (Eds.) (2008) **Hybrid Simulation; Theory, Implementation and Applications**, Taylor & Francis.

11. Bourdarot, E., Mazars, J., and Saouma, V.E. (Eds.), **Fracture and Failure of Concrete Dams**, Balkema, 1994.
10. Reich, R. and Saouma, **Fracture Mechanics Analysis of Gravity Lock Monolith**, *Engineering Technical Letter, No. ETL 1110-2-344*, US Army Corps of Engineers Civil Works, Engineering Division, Nov. 1992.
9. Plizzari, G., Saouma, V.E., and Waggoner, F., **Sperimentazione in Centrifuga di Dighe a Gravita in Calcestruzzo**, *Studi e Ricerche*, Vol. 13, Scuola di Specializzazione in Costruzioni in C.C., Fratelli Pesenti, Politecnico di Milano, pp. 359-394, 1992.
8. Saouma, V.E., and Brühwiler, E., **Engineering and Design Fracture Mechanics Analysis of Concrete Hydraulic Structures**, *Engineering Technical Letter, No. ETL 1110-2-8003*, US Army Corps of Engineers Civil Works, Engineering Division, Nov. 1991.
7. Saouma, V.E., Dungar, R., and Morris, D., (Eds.), **Proceedings of the International Conference on Dam Fracture**, GS-7491, Electric Power Research Institute, Palo-Alto, Sept. 1991.
6. Saouma, V.E., **Innovative Analysis and Design Procedures for Concrete and Arch Dams**, in *Jubilee Volume commemorating the retirement of Prof. L. Serafim*, Coimbra, Portugal, Oct. 1991.
5. Saouma, V.E., Ayari, M.L., and Boggs, **Static and Dynamic Fracture Mechanics of Concrete Dams**, in *Fracture Mechanics of Concrete Structures, From Theory to Applications*, L. Elfgren Editor, pp. 336-354, Chapman and Hall, 1989.
4. **Computer Application in Concrete Technology**, ACI, SP106, 1988.
3. Saouma, V.E., Ayari, M.L., and Boggs, H., **Fracture Mechanics of Concrete Gravity Dams**, in *Fracture of Concrete and Rock*, S. Swartz, and S. Shah Editors, pp. 311-333, Springer-Verlag, 1989, (Translated into Chinese).
2. Saouma, V.E., Sikiotis, E.S., **On the Optimization of Partially Prestressed Concrete Beams**, in *Partial Prestressing, From Theory to Practice* M.Z. Cohn, Ed., PP. 411-425, Martinus Nijhoff Publ., 1986.
1. Ingraffea, A.R., Saouma, V.E., **Numerical Modelling of Discrete Crack Propagation in Reinforced and Plain Concrete**, in *fracture Mechanics of Concrete, Structural Application and Numerical Calculation*, G.C. Sih, and A. de Tomaso, Editors, Martinus Nijhoff Publ., 1984.

Invited Papers

14. Saouma, V., Uchita, Y., Yagome, Y. **Research needs in Seismic Safety of Dams**, *Proceedings of the 4th US-Japan Workshop on Advanced Research on Dams*, Technical Memorandum No. 4075, Public Works Research Institute, Tsukuba, Japan, pp. 279-293 May, 2007.
13. Saouma, V. **Advanced Joint Modelling**, in *NW-IALAD, European network on Dam Engineering*, Barcelona, November, 2004.
12. Saouma, V. **Nonlinear Dynamics of Concrete Joints; from Theory to Dam Applications**, in *NW-IALAD, European network on Dam Engineering*, Zurich, Sept. 2004.

11. Saouma, V. and Chang, S.Y., **Numerical Simulation of Reinforced Concrete Deterioration due to Steel Corrosion, Freezing-Thawing and Mechanical Load Effects** in *Life-Cycle Performance of Deteriorating Structures: Assessment, Design and Management*, Special Publication of ASCE, Eds., D.M. Frangopol, E. Bruhwiler, M.H. Faber, and B. Adey, 2003
10. Saouma, V.E. and Uchita, T., **3D Nonlinear Dynamic Analysis of Concrete Dams**, *ICANCEER International Conference on Advances and New Challenges in Earthquake Engineering Research*, Harbin, PRC, Aug. 2002
9. Saouma, V.E., **Numerical Simulation of Concrete Deterioration**, *NSF Workshop*, Prague, July 2002
8. Saouma V. E., Červenka J., **Finite Element Analysis of R/C Structures A Hybrid Approach**, *US Japan Seminar on Post-Peak Behavior of Reinforced Concrete Structures Subjected to Seismic Loads Lake Yamanaka*, Oct. 25-29, 1999.
7. Saouma V. E., Červenka J., Slowik V., & Chandra Kishen J. M., **Mixed mode fracture of rock-concrete interfaces**, *US-Europe Workshop on Fracture and Damage of Quasi-Brittle Materials: Experiment, Modeling and Computer Analysis*, Prague, Czech Republic, Sep. 21-23, 1994.
6. Saouma, V.E., **Fracture Mechanics of Concrete Dams**, Keynote Speaker at the *Fracture Mechanics for Hydroelectric Power Systems Symposium*, Vancouver, September 1994.
5. Saouma, V.E., **Size Effects and Fractal Analysis of Concrete; Byproducts of a Dam Fracture Research Project**; *Int. Conference on Size Effect* Sendai Japan, Nov. 1993.
4. Reich, R., Červenka, J., Plizzari, G., and Saouma, V., **Implementation and Validation of a Nonlinear Fracture Model in a 2D/3D Finite Element Code**, *First Bolomey Workshop*, ETH, Zurich, July 1992.
3. Saouma, V., Červenka, J., Keating, S., Reich, R., and Waggoner, F., **Fracture Mechanics of Concrete Dams**, *Int. Conference on Fracture Mechanics of Concrete Structures*, Breckenridge, CO, June 1992.
2. Saouma, V.E., Reich, R., **Fracture Mechanics Analysis of Lock and Dam 27**, *US Army Corps of Engineers Structures Conference*, Jacksonville, July 1991.
1. Saouma, V.E., Ayari, M., and Boggs, H., **Fracture Mechanics of Concrete Gravity Dams**, *Fracture of Dams*, Session, International Conference on Fracture of Concrete and Rock, Houston, June 1987, Springer-Verlag, pp.311-333.

Refereed Conference Proceedings

49. Puntel, E. and Saouma, V. **Experimental Behaviour of Concrete Joint Interfaces Under Reversed Cyclic Loading**, in *Analytical Models and New Concepts in Concrete and Masonry Structures*, AMCM'2008, Lodz, Poland, June 2008.
48. Uruchida, S., Yagome, Y., Kubota, K., Uchita, Y., Saouma, V., **Experimental Investigation of Dynamic Uplift in Concrete Gravity Dams**, *ICOLD Annual Meeting Symposium*, St Petersburg, June 2007

47. Al-Mahaidi, R., Pham, H.B., Saouma, V., **Discrete-Smeared Crack Finite Element Mechanisms in RC Members**, 8th International Symposium on Fiber Reinforced Polymer Reinforcement for Concrete Structures, FRPRCS-8, Patras, July 2006
46. Pham, H.B., Al-Mahaidi, R., Saouma, V., **Modelling of CFRP-Concrete Bond Using Smeared and Discrete Cracks**, International Symposium on Bond Behaviour of FRP in Structures (BBFS 2005)", Chen and Teng (eds.), 2005
45. Saouma, V., Perotti, L. **Alkali Aggregate Reactions in Dams; Stress Analysis and Long Term Predictions**, American State Dam Safety Official (ASDSO) Conference on Dam Safety, New Orleans, Sept. 2005.
44. Uruchida, S., Shimpo, T., Uchita, Y., Yagome, Y., Saouma, V. **Dynamic Centrifuge Analysis of Concrete Gravity Dam**, 73rd Annual Meeting of ICOLD, Teheran, IRAN, paper No. 085-04, 2005
43. Puntel, E., Bolzon, G., Saouma, V., **Numerical and Experimental Investigation of Joints Subjected to Cyclic Loading**, International Conference on Fracture Mechanics, Torino, page 396, March 2005.
42. de Sanctis, F., Saouma, V. Viggiani, G. and Denarie, E. **Fracture Mechanics Characterization of Fine-Grained Tuff** EURO-Conference on Rock Physics and Geomechanics, Postdam, 20-23 Sept. 2004.
41. Noguchi, H., and Saouma, V., **An Investigation of Freeze-Thaw in Dam Concrete; Experimental and Numerical Study**, in Proceedings of Concrete Under Severe Conditions, Oh, B.H. Editor, Korea Concrete Institute, pp. 506-513, 2004
40. Camata G., Spacone E. and Saouma V., **Nonlinear modeling of debonding failure of RC structural members strengthened with FRP laminates**, Proceedings of 6th International Symposium on Fibre-Reinforced Polymer (FRP) Reinforcement for Concrete Structures (FRPRCS-6), Singapore, July, 2003.
39. Camata G., Spacone E. and Saouma V., **Modeling FRP strengthened reinforced concrete structural members using nonlinear finite elements**, fib-Symposium Concrete Structures in Seismic Regions, May 6-9, Athens, 2003.
38. Camata G., Spacone E. and Saouma V., **Nonlinear Fracture mechanics analysis of brittle failure modes of post-strengthening aged/damaged Reinforced Concrete structural members with Fiber Reinforced Polymer materials**, proceedings of Bond in Concrete - from research to standards, Budapest, November 2002.
37. Hansen E.J. and Saouma, V.E., **Numerical Simulation of Reinforced Concrete Deterioration**, *FRAMCOS-3 Proceedings*, pp 1655-1668, Mihashi and Rokugo Eds., AEDIFICATIO publishers, 1998.
36. Shinmura, A. and Saouma, V.E., **The Study of Water Leakage Through Fracture in Reinforced Concrete**, *FRAMCOS-3 Proceedings*, pp 1677-1686, Mihashi and Rokugo Eds., AEDIFICATIO publishers, 1998.
35. Plizzari, G., Saouma, V.E, and Slowik, V., **Comportamento del Calcestruzzo Fessurato in Presenza di Carichi Ciclici di Ampiezza Variabile**, Gruppo Italiano Frattura, (IGF 11), pp. 297-306, Brescia, 1995.
34. Slowik, F., Kishen, C., Saouma, V., and Morris, D., **Rock/Concrete Cracks; Myths and Realities**, WaterPower 1995, San-Francisco, July 1995.
33. Červenka, J., Saouma, V. and Morris, D., **MERLIN: a 2D/3D Finite Element Pro-**

- gram for Safety Assessment of Cracked Dams**, WaterPower 1995, San-Francisco, July 1995.
32. Plizzari, G., and Saouma, V., **Linear or Nonlinear Fracture Mechanics of Concrete?** Proceedings of the 2nd International Conference on Fracture Mechanics for Concrete and Concrete Structures (FraMCoS2), Wittmann, F.H. (Ed.), Zurich, July 1995.
 31. Slowik, F. and Saouma, V., **Transient Fluid Fracture Interaction**, Proceedings of the 2nd International Conference on Fracture Mechanics for Concrete and Concrete Structures (FraMCoS2), Wittmann, F.H. (Ed.), Zurich, July 1995.
 30. Červenka, J., and Saouma, V., **Discrete Crack Modeling in Concrete Structures**, Proceedings of the 2nd International Conference on Fracture Mechanics for Concrete and Concrete Structures (FraMCoS2), Wittmann, F.H. (Ed.), Zurich, July 1995.
 29. Červenka, J., Boggs, H., Plizzari, G., and Saouma, V., **Non-Linear Analysis of Joint Behavior Under Thermal and Hydrostatic Loads for an Arch Dam**, *Third Benchmark Workshop on Numerical Analysis of Dams*, ICOLD, Paris, Spetember, 1994, Vol 1, pp. 255-277.
 28. Červenka, J., Boggs, H., Plizzari, G., and Saouma, V., **Evaluation of Critical Uniform Temperature Decrease of a Cracked Buttress Dam**. *Third Benchmark Workshop on Numerical Analysis of Dams*, ICOLD, Paris, Spetember, 1994, Vol 2, pp. 467-485.
 27. Reich, R., Červenka, J., and Saouma, V., **MERLIN: A Computational Environment for 2D/3D Discrete Fracture Analysis**, Proceedings of the EURO-C 1994 Conference on Computational Modelling of Concrete Structures, 1994.
 26. Slowik, V., and Saouma, V., **Investigation on Cracking of Concrete with Applications to the Seismic Safety of Dams**, Proceedings of the EURO-C 1994 Conference on Computational Modeling of Concrete Structures, 1994.
 25. Saouma, V.E., Boggs, H., and Morris, D., **Safety Assessment of Concrete Dams Using Fracture Mechanics**, Q.68, R.84, Proceedings of the 18th ICOLD (International Commission on Large Dam) Conference, pp. 1415-1435, Durban 1994.
 24. Perrone, C., Songer, A.D., and Saouma, V., **A Hypermedia-Based Framework for an Integrated Civil Engineering Curriculum**, American Society of Engineering Education, Gulf-Southwest Annual Meeting, Austin, TX, 1993
 23. Songer, A.D., Perrone, C., and Saouma, V., **aHyper CE: Computer Aided Instruction for the Introduction to Civil and Architectural Engineering**, American Society of Engineering Education, Gulf-Southwest Annual Meeting, Austin, TX, 1993
 22. Saouma, V., Červenka, J., Keating, S., Reich, R., and Waggoner, F., **Fracture Mechanics of Concrete Dams**, Proceedings of the Int. Conference on Fracture Mechanics of Concrete Structures, Elsevier Applied Science, pp. 404-412, 1992.
 21. Reich, J., Cervenka, J., and Saouma, V., **Computational Fracture Mechanics of Concrete**, ASCE Specialty Conference in Computational Mechanics, Texas, 1992.
 20. Reich, R., Cervenka, and Saouma, V.E., **Numerical Techniques for 2D and 3D Nonlinear Fracture Mechanics Based Analysis of Dams**, Proceedings of the Int. Conf. on Dam Fracture, pp. 163-182, Boulder CO. Published by Electric Power Research Institute, GS-7491, Palo-Alto, Sept. 1991.
 19. Saouma, V.E., Brühwiler, E., Keating, S., Ryan, J., and Schulz, J., **Innovative Fracture Testing Techniques for Dam Engineering**, Proceedings of the Int. Conf. on Dam

- Fracture, pp. 459-475, Boulder CO. Published by Electric Power Research Institute, GS-7491, Palo-Alto, Sept. 1991.
18. Brühwiler, E., and Saouma, V.E., **Water Fracture Interaction in Cracked Concrete Dams**, Proceedings of the Int. Conf. on Dam Fracture, pp. 551-567, Boulder CO. Published by Electric Power Research Institute, GS-7491, Palo-Alto, Sept. 1991.
 17. Saouma, V.E., Brühwiler, E., Boggs, H., and Morris, D., **A Comprehensive Investigation of Fracture Mechanics of Concrete Dams**, Workshop on Application of Fracture Mechanics to Dam Engineering, Locarno, Sept. 17-18, 1990
 16. Brühwiler, E., and Saouma, V.E., **Fracture Testing of Rock by the Wedge Splitting Test**, Proceedings of the 31st US Rock Mechanics Symposium, June 1990, Golden CO, pp. 287-294
 15. Saouma, V., Dambowy, J., and Commander, B., **Automated Design of R/C Structures from Graphics to Expert Systems**, Proceedings of the second *Int. Conference on Computer Aided Analysis and Design of Concrete Structures*, pp. 479-489, Zell-Am-See, Pineridge Press, Vol. 1, N. Bicanic and H. Mang Ed.
 14. Saouma, V.E., Broz, J.J., Boggs, H.L., and Brühwiler, E. **A Comprehensive Investigation of Fracture Mechanics of Concrete Dams**, *International Symposium on Analytical Evaluation of Dam Related Safety Problems, Theme A: Concrete Dams-Fracture Problems*, ICOLD 57th Executive Meeting, Copenhagen, July 1989.
 13. Saouma, V.E., Doshi, S., Jones, M.S., Sikiotis, E.S., **Research in Computer Aided Design of Reinforced Concrete at the University of Colorado**, *Proceedings of the ACI Symposium on Usage of Computers*, San Antonio, 1987.
 12. Saouma, V.E., Droz, P., **Mixed Mode Blunt Crack Instability Using a Path Independent Contour Integral**, *Proceedings of the 8th Int. Conf. on Structural Mechanics in Reactor Technology*, Brussels, Aug. 1985.
 11. Saouma, V.E., **Computer Graphics Aided Simulation of Crack Propagation**, *Proceedings of the XIII International Finite Element Congress*, Baden Baden, W. Germany, Nov. 19-20, 1984.
 10. Saouma, V.E., and Sikiotis, E.S., **Interactive Computer Graphics in the Design of Reinforced Concrete Buildings**, *Proceedings of the Int. Conf. on Computer Aided Analysis and Design of Concrete Structures*, pp. 937-950, Pineridge Press, 1984.
 9. Saouma, V.E., Jones, M.S., Jones, R.A., **CAI of Structural Analysis and CAE Laboratory Development**, *Proceedings of the National Conference on University Programs in Computer Aided Engineering, Design, and Manufacturing*, Lehigh University, 1984, pp. 179-185.
 8. Saouma, V.E., and Sikiotis, E.S., **Application of Partial Prestressing Optimization**, *NATO/ARW Partial Prestressing: From Theory to Practice*, M.Z. Cohn, Editor, Paris 1984.
 7. Saouma, V.E., and Sikiotis, E.S., **Interactive Graphics Nonlinear Constrained Optimization**, *NASA CP 2335, Research in Structures and Dynamics*, 1984, pp. 143-157.
 6. Saouma, V.E., and Kleinosky, M.J., **Finite Element Simulation of Rock Cutting: a Fracture Mechanics Approach**, *Proceedings of the 25th U.S. Symposium on Rock Mechanics*, Northwestern University, Evanston IL, June 1984, pp. 792-799.
 5. Saouma, V.E., **Computer Graphics Simulation of Crack Propagation**, *Proceed-*

- ings of the Third International Conference on Numerical Methods in Fracture Mechanics*, Swansea, U.K., pp. 219-233, March, 1984, Pineridge Press.
4. Saouma, V.E., and Zatz, I.J., **An Automated Finite Element Procedure for Fatigue Crack Propagation Analyses**, *paper No. AIAA 83-0841, Proc. of the 24th AIAA/ASME/ASCE/AHSSDM Conference*, Lake Tahoe, Nevada, June 1983, pp. 196-204.
 3. Saouma, V.E., and Ingraffea, A.R., **Discrete Crack Modelling in Reinforced Concrete**, *Proc. of the Engineering mechanics Specialty Conference*, ASCE, Purdue University, June 1983, pp. 1005-1008.
 2. Saouma, V.E., and Hoelzeman, R. **Computer Graphics Aided Instruction of Structure**, *Proc. of the Eighth Conference on Electronic Computation*, Houston, Texas, Feb. 1983, pp. 209-222.
 1. Saouma, V.E., and Ingraffea, A.R., **Fracture Mechanics Analysis of Discrete Cracking**, *Proc. of the IABSE Colloquium on Advanced Mechanics of Reinforced Concrete*, Delft, 1981.
-

Supervised Dissertations

Ph.D.:

10. Kang, Dae-Hung **COMputational ENvironment for Real Time Hybrid SIMulation**, ANTicipated 2008.
9. Puntel, Eric **Experimental and numerical investigation of the monotonic and cyclic behaviour of concrete dam joints**, Politecnico di Milano 2004.
8. Puatatsananon, Wiwat **Numerical Simulation of Coupled Chemical-Mechanical Deterioration of Concrete**, 2002
7. Chandra, K., **Interface Cracks: Fracture Mechanics Studies leading towards Safety Assessment of Dams**, May 1996.
6. Červenka, J., **Discrete Crack Modeling in Concrete Structures**, 1994.
5. Reich, R., **On the Marriage of Fracture Mechanics and Mixed Finite Element Methods: An Application to Concrete Dams**, 1993..
4. Prinaris, A., **Flow Processes in Nonlinear Material Modelling Synthesis and Homogenization**, 1990.
3. Gamal-El-Din, **Fractal Dimensions and Fracture Properties of Cracked Concrete**, 1990.
2. Ayari, M., **Static and Dynamic Fracture Mechanics of Concrete Gravity Dams**, 1988
1. Sikiotis, E., **Innovative Techniques in Structural Optimization**, 1987

M.S.:

25. Perotti, L. **Alkali Aggregate Reactions in Concrete Dams**, Politecnico di Milano, June 2004.

24. Ruolo, Dora **Interface Crack Joints Under Cyclic Loads**, Politecnico di Milano, Jan. 2004
23. Chang, P., **Finite Element/Fracture Mechanics Simulation of Heterogeneous Materials**, 2002.
22. Gillan, Chad **Centrifuge Testing of Concrete Dams**, Aug. 2002
21. Puatatsananon, Wiwat **Probabilistic Fracture Mechanics**, Aug. 1998
20. Hansen, Eric, **Rate Deterioration Investigation of Bridge Decks Based on Diffusion/Fracture Mechanics Numerical Study**, Aug. 1997.
19. Fox, Kristen, **Fracture Mechanics Analyses of Anchor Bolts**, Aug. 1996.
18. Ostrander, Keith, **Applications of Fiber Optics in the Strain Measurement of Structures**, Aug. 1996.
17. Shinmura, A., **Fluid Fracture Interaction in Pressurized Reinforced Concrete Vessels**, 1995
16. Roh, Y., **Numerical Simulation of Fluid Flows in Cracked Concrete**, 1995
15. Winkler, L. **Development of a Workbench of Mechanics, Materials and Structures Experiment**, 1994
14. Hermanrud, J. (CS), **Development of a Three Dimensional Finite Element Post-Processor**, 1993
13. Wigner, W., **Three Dimensional Fracture Mechanics Analysis of an Arch Dam**, 1993.
12. Dewey, R. **Uplift Modelling for Fracture Mechanics Analysis of Concrete Gravity Dams**, 1993.
11. Waggoner, F., **Centrifuge Testing of Concrete Gravity Dams**, M.S. Aug., 1992.
10. Ryan, J., **Effect of Bi-Axial Confinements on Fracture Properties of Concrete, Laboratory and Field Tests**.
9. Broz, J. **Experimental Fracture Mechanics of Concrete Dams**, 1989.
8. Commander, B., **An Improved Method of Bridge Evaluation: Comparison of Field Test Results with Computer Analysis**, 1989.
7. Dambowy, J., **A Knowledge Based Expert System for the ACI Building Code**, 1989.
6. Doshi, S., **Knowledge Based Expert System for Reinforced Concrete Design Checking**, 1987.
5. Jones, M., **A Prototype Hybrid Expert System for Structural Design**, 1987.
4. Sikiotis, E., **Computer Graphics Aided Design of Reinforced Concrete Frames**, 1983.
3. Flango, R., **Graphical PreProcessor for Steel and Concrete Orthogonal Building Frames**, 1983.
2. Murad, M., **Partially Prestressed Concrete Beam Optimization**, 1983
1. Schwemmer, S., **Numerical Evaluation of the Quarter Point Singular Element**, 1983

Foreign Jury Member

1. Ragueneau, Frederic These d'habilitation a la Recherche, France, Oct. 2006.

2. Berthet-Rambaud, Philippe, **Structures Rigides Soumises aux Avalanches et Chutes de Blocs: Modlisation du Comportement Mcanique et Caractrisation de l'Interaction "Ala-Ouvrage"**, Doctoral Thesis, Universite de Grenoble, July 2004.
 3. Bournazel, Jean Pierre, **Contribution a l'Etude du Caractere Thermomecanique de la Maturation du Beton**, Doctoral Thesis, Ecole Normale Superieure, Cachan, July 1992.
 4. Jouhari, M., **Dynamic Crack Growth with Internal Uplift Pressures**, Ecole Nationale des Ponts et Chaussees, Paris, France, 1992.
-

Typed Lecture Notes

1. [Structural Engineering; Analysis & Design](#), 664 pages
2. [Structural Concepts and Systems for Architects](#), 265 pages
3. [Reinforced Concrete](#) 175 pages
4. [Computer Literacy for Undergraduates](#), 233 pages
5. [Finite Element Analysis of Frames](#), 280 pages
6. [Finite Element Analysis](#), 280 pages
7. [Advanced Mechanics of Materials](#), 280 pages
8. [Fracture Mechanics](#), 474 pages

Those notes can be downloaded from my personal web page <http://civil.colorado.edu/~saouma/Lecture-Notes>

Technical Reports

Over 100 Technical Reports written to sponsors.

Software Development

Major Programs, Active

Mercury An Optimized Nonlinear Finite Element Code for Real Time Hybrid Simulation.

MERLIN 3D Nonlinear Finite Element Program, (1991-Present), Funded by Electric Power Research Institute (EPRI), and Tokyo Electric Power Service Company (TEPSCO).

Spider , a general purpose Windows/Open-GL based finite element graphical postprocessor. (1991-Present), Funded by Electric Power Research Institute (EPRI), and Tokyo Electric Power Service Company (TEPSCO).

KumoNoSu a general purpose 3D finite element generator particularly suited for cracked structures, reinforced concrete, and dam structures, (1999-present), Funded by Tokyo Electric Power Service Company (TEPSCO).

Beaver Program for the automation of the layout of double curvature arch dams

PARSIFAL (Particle Simulator for Analysis), a 2D/3D generator for heterogeneous materials with particle collision detection, (2002-Present), Funded by National Science Foundation

SIMSAR (Simulation of Silica Aggregate Reactions) in concrete, (2002-2003), Funded by Swiss Dam Safety Agency.

CDAP (Concrete Deterioration Analysis Program), coupled nonlinear multiphysics simulation of heat, moisture, chloride and carbon diffusion in concrete, (2002-Present), Funded by National Science Foundation.

Others

1. Instructional:

- (a) @ISDS3: A graphical based program for the analysis of 2 and 3D structures.
- (b) *Bechtel Lab: Supervision of the development of a User Interface to facilitate operation of Unix workstations by Undergraduate students.
- (c) *HyperCE: A Hypertext Based Instructional System for the Bechtel Laboratory.
- (d) @AUTOCRK, Program for the simulation of fatigue crack propagation in aircraft, VAX/CRAY, General Dynamics, Fort Worth, Texas
- (e) @BFXFEM, Program to analyze fracture of bones, Biomechanics Laboratory, Dept. of Orthopaedic Surgery, University of Iowa.
- (f) @ROCKFRAC, Program to assess tunnel boring machine performance on the basis of fracture mechanics, PCS Mining, Saskatchewan, Canada.
- (g) *ADS/ABAQUS interface to perform structural optimization in conjunction with large scale finite element analysis, Cray Research (Mendotta Heights) & General Dynamics, Fort-Worth, TX.
- (h) M1toS1 Program to automate translation of Knowledge Bases from M1 to S1, General Dynamics, Fort-Worth, TX.
- (i) *ADSXPRT An Expert System to select best combination of ADS Options, General Dynamics, Fort Worth, TX
- (j) *@ACI318-KB An Expert System to check compliance of reinforced concrete design with ACI code, US Army Corps of Engineers, Vicksburg, MS
- (k) *@LOGG, A program to automate the load definition of 3D hydraulic structures, US Army Corps of Engineers, Vicksburg, MS.
- (l) @IGLAD, Interactive Graphics Layout of Arch Dams, US Army Corps of Engineers, Vicksburg, MS
- (m) @CDAM 1-2-3 Three PC based programs for the fracture mechanics based analysis of cracked dams, Electric Power Research Institute, Palo-Alto, CA

* Supervised; @ Developed

Video Production

- 1. Saouma, V. **Experimental and Numerical Seismic Safety Investigation of Marunuma Dam**, English/Japanese DVD prepared for the Tokyo Electric Power Company.

2. Saouma, V., **Building the Future; Computing in Civil Environmental, and Architectural Engineering at the University of Colorado at Boulder**, 20' tape sent to all High Schools in the State of Colorado, 1993.
3. Saouma, V., **Fracture Mechanics of Concrete**, 20' tape produced for the US Army Corps of Engineers, 1992.
4. Saouma, V., **Centrifuge Testing of Concrete Gravity Dams**, 30' tape produced for the Electric Power Research Institute, 1991.

Funded Research

Principal Investigator			
Oct. 08- Nov. 09	Development of Finite Element Code Mercury	NEESinc	\$120,000
Jul. 08 - Mar. 09	3D Nonlinear Dynamic Analysis of Dams; Software Development and Technical Support.	Tokyo Electric Power Service Company	\$130,000
Jul. 07 - Mar. 08	3D Nonlinear Dynamic Analysis of Dams; Software Development and Technical Support.	Tokyo Electric Power Service Company	\$130,000
Jul. 07 - Mar. 08	AAR Expansion in Concrete under Triaxial Confinement.	Tokyo Electric Power Service Company	\$70,000
September 07	NEESinc	Workshop Organization at CU-NEES	\$7,500
Aug. 07- Dec. 07	NEESinc	Localization of Open-Fresco and SIMCOR at CU-NEES	\$31,000
Jul. 06 - Mar. 07	AAR Expansion in Concrete under Triaxial Confinement.	Tokyo Electric Power Service Company	\$64,000
Jul. 06 - Mar. 07	Life Prediction of AAR Affected Structures	Tokyo Electric Power Service Company	\$20,000
Jul. 06 - Mar. 07	3D Nonlinear Dynamic Analysis of Dams; Software Development and Technical Support.	Tokyo Electric Power Service Company	\$150,000
Jul. 06	Integration of Fast Hybrid Testing with a Cluster of 124 CPU	University of Colorado (Prof. Cai, Co-Pi)	\$28,000
Jan. 06- Sep. 09	Operation and Maintenance of the Colorado NEES Site	National Science Foundation	\$949,063
Nov. 05 - Mar. 06	Nonlinear Fracture Mechanics of Solid Rocket Propellant	Bayern-Chemie GmbH, Aschau/Inn, Germany	—
Jun. 05 - Mar. 06	Nonlinear Simulation of an AAR Affected High Voltage Transmission Tower	Tokyo Electric Power Service Company	\$20,000

Dec-04 - Mar. 05	Numerical Simulation AAR Deterioration in a High Voltage Transmission Tower	Tokyo Electric Power Service Company	\$ 10,000
Jan. 03 - Dec. 04	Cyclic Response of Concrete Joints	Italian Ministry of Research	38,000 Euro
Mar. 02 - Dec.02	Generation of a 3D Finite Element Mesh for a Nuclear Reactor Panel	Electricité de France	10,000 Euro
Jan-02- Dec-04	Numerical Investigation of Alkali-Aggregate Reactions in Dams	FOWG, Switzerland	CHF 100,000
Aug. 02 - Mar. 07	Static and Dynamic Dam Safety Investigation Using Fracture Mechanics	Tokyo Electric Power Service Company	\$ 891,599
Aug. 00 - Jul. 02	Static and Dynamic Dam Safety Investigation Using Fracture Mechanics	Tokyo Electric Power Service Company	\$ 635,423
Jun. 00 - May 02	Deterioration of Reinforced Concrete; A Fracture Mechanics Approach	National Science Foundation	\$ 128,000
Jan.94 - Aug. 94	Mixed Mode Testing of Rock/Concrete Interfaces	Electric Power Research institute	\$ 57,000
Aug. 93 - Jul. 94	Development of Instructional Workbenches for Small Scale Structural Testing	Univ. of Colorado	\$ 20,000
Jan. 93 - Dec. 93	Large Scale Mixed Mode Testing of Rock/Concrete Interfaces	Electric Power Research Institute	\$ 171,312
Jan. 90 - Dec. 91	Uplift Pressure in Dam Cracks under Seismic Loading, and 3D Fracture Analysis of Concrete Gravity Dams	Electric Power Research Institute, and Pacific Gas and Electric	\$ 150,000
Jun. 89 - May 92	Fracture Mechanics of Concrete Dams: Part II From Theory to Applications; Static Case.	Electric Power Research Institute	\$ 592,000
May 89 - Aug. 90	Effect of Uplift Pressure on Fracture Characterization of Concrete: Design and Evaluation of Testing Procedure	Electric Power Research Institute	\$ 41,857
Jul. 88	Donation of two Apollo DN3500 workstations	Apollo Computer	\$ 54,000.
Feb. 88 - Jan. 89	Design and Checking Automation of Reinforced Concrete Structures	U.S. Army Corps of Engineers	\$ 60,037.
Feb. 88 - Jan. 89	Load Module Development for 3DSAD	U.S. Army Corps of Engineers	\$ 42,493.
Dec. 87 - Feb. 88	Integrated Computer Aided Design of Complex Structures	General Dynamics, Advanced Analysis Group	\$ 21,000.

Dec. 87 - Jun. 88	Implementation of a Distributed Finite Element Based Structural Optimization Program on a CRAY/XMP	Cray Research	Computer and Technical Support
Jun. 87 - Nov. 88	Fracture Mechanics of Concrete Dams	Electric Power Research Institute	\$ 131,809
Dec. 86 - Sep. 87	Elasto-Plastic Fracture Mechanics of Welded Plates	National Bureau of Standards	\$ 9,594.
Sep. 86 - Jun. 87	Instructional Expert System for ACI Code Provisions	University of Colorado	\$ 3,998.
Sep. 86 - Aug. 87	Expert System Development for R/C Beam Design Checking; Part I.	U.S. Army Corps of Engineers	\$ 99,820.
Aug. 86 - Dec. 86	Finite Element Simulation of Rock Hydrofracture near a Subsurface Cavity	U.S. Army Corps of Engineers	\$ 7,200.
Sep. 85 - Aug 86	Engineering Research Equipment Grant: Network of High Performance "Computational Workstations" (Co P.I. K. Willam. C. Gustafson) Matching Fund	National Science Foundation University of Colorado	\$ 76,400. \$ 50,000.
Feb. 86 - Sep. 86	An Automated Model for the Load Definition Module of the 3DSAC CDAMS Program	U.S. Army Corps of Engineers	\$ 13,000.
Oct. 85 - Sep. 86	Implementation of an Integrated Fatigue Life Prediction Program on a Cray	General Dynamics, Fort-Worth, TX	\$ 47,000.
Sep. 85 - May 86	Application of Artificial Intelligence to Reinforced Concrete Design	CRCW, Univ. of Colorado	\$ 2,500.
Sep. 85 - Aug. 86	Fracture Mechanics of Concrete Dams	Bureau of Reclamation	\$ 9,995.
Aug. 85 - Dec. 85	Numerical and Experimental Studies on Bitt Cutter Performance	PCS Mining, Saskatchewan	\$ 17,000.
Oct. 83 - Nov. 85	Partially Prestressed Concrete Beam Optimization	National Science Foundation; Research Initiation Grant	\$ 47,967.

Co-Principal Investigator			
Apr 89 - Mar 91	Brittle-Ductile Failure Mechanics of Mortar and Concrete (Co P.I. K. Willam & S. Sture)	US-AFOSR	\$ 137,971.
	Personal Contribution 33.3%		\$45,990
Jul. 88 - Jan. 91	Load Prediction and Structural Response of Bridges (Co-P.I. G. Goble, D. Frangopol, J. Dow)	Federal Highway Agency	\$ 800,000.
	Personal Contribution 10%		\$80,000

Jun. 88 - May 89	Simulation of Progressive Failure in Solids and Structures (Co-P.I. K. Willam, S. Sture)	National Science Foundation	\$ 191,000.
	Matching Fund	University of Colorado	\$ 15,000.
	Personal Contribution 25%		\$51,500
Oct. 87 - Sep. 89	Simple Load Capacity Tests for Bridges to Determine Load Posting Levels (Co P.I. G. Goble, D. Frangopol)	Pennsylvania Department of Transportation	\$ 220,572.
	Personal Contribution 33%		\$72,788
Aug. 87 - Jul. 88	Brittle-Ductile Failure Mechanics of Mortar and Concrete (Co P.I. K. Willam & S. Sture)	US-AFOSR	\$ 50,000.
	Personal Contribution 15%		\$7,500

Wrote final proposal for the establishment of the **Bechtel Computer Aided Design Laboratory**, \$1,000,000.

Short Courses

1. Short course on AAR, Paris, October 2009.
 2. Workshop on Dam Research Needs, Boulder Sept. 2007
 3. Workshop on Fast Hybrid Simulation, Boulder Aug. 2007
 4. Alkali Aggregate Reactions in Massive Concrete Structures; Boulder, CO, April 2007
 5. Workshop on Fast Hybrid Simulation, Boulder Nov. 2006
 6. Alkali Aggregate Reactions in Massive Concrete Structures; Boulder, CO, April 2005
 7. Alkali Aggregate Reactions; and Dynamic Analysis of Dams; International Center for Structure mechanics (CISM), Udine, December 2004.
 8. Nonlinear Dynamics of Concrete Dams, 4 hours in a Course at the Politecnico of Milan on Nonlinear Dynamic Analysis of Structures, July 2004.
 9. *Recent Advances in Engineering for Concrete Dams*, with Dungar, R., and Boggs, H.; 58 Participants from 14 countries, Sept. 9-10 1991 Boulder CO.
-

Consulting Editor

Dam Engineering, A Quarterly Journal affiliated with *International Water Power & Dam Construction*.

Lectures, Conference Presentations

71. Nonlinear Analysis of Concrete Dams, Vattenfall, Sweden, May 2009.
72. Hybrid Simulation of reinforced Concrete Structures, University of Toulouse, May 2009
73. Nonlinear analysis of concrete Dams, University of Roma (3), March 2009.
74. Numerical Modelling of alkali-Aggregate Reactions, University of Toulouse, March 2009.
75. CU-NEES Fast Hybrid Testing Facility, 6th NEES Annual Meeting in Portland, June 2008.
76. Concrete Dams; Aging, Cracking and Shaking. Delft Technical University, May 2008
77. Hybrid Simulation Research at CU-NEES, presented at the French Atomic Energy Commission, Saclay, France 2007
76. Modelling AAR with Merlin, ICOLD Workshop on Chemical Expansion in Concrete, Granada, 2007
75. Modeling of Alkali-Aggregate Reactions in Concrete, Swiss Federal Institute of Technology, Lausanne, July 2007.
74. Hybrid Testing at CU-NEES, LMS Corporation, Louvain, Belgium, July 2006.
73. Hybrid Testing Perspective, Central Research Institute of the Power Industry (CRIEPI), Abiko, Japan June 2006.
72. Seismic Analysis of Concrete Dams, Shimizu Laboratory, Tokyo, June 2006
71. Discrete Crack Models in Fracture Mechanics, Ecole des Mines, Sophia-Antepolis, France, July 2005.
70. 3D Nonlinear Dynamics Analysis of Concrete Dams. EPFL, Lausanne, March 2005.
69. Alkali Aggregate Reactions in Concrete Dams, US Bureau of Reclamation, March 2005
68. Nonlinear Finite Element Modeling of CFRP; *SIKA Research Group*, Zurich, November 2004.
67. Advanced Analysis of Dams; *ENDESA*, Barcelona, November 2004.
66. Nonlinear Analysis of Concrete Dams; *Korean Water Company (KOWACO)*, Seoul, June, 2004.
65. Dynamic Analysis of Arch Dams; From Theory to Applications. *Ministry of Water Resources*, Teheran, Iran, June 2004.
64. Theory of Dynamic Analysis of Arch Dams. *Sharif University*, Teheran, June 2004.
63. Nonlinear Dynamic Analysis of Dams; *Department of Applied Mathematics, Politecnico di Milano (MOX)*, May, 2004
62. Numerical Simulation of Alkali Aggregate Reaction in Concrete Dams, US Bureau of Reclamation, April 2004.
61. Dam Engineering Challenges; Seismic and AAR Analysis; *Accademia Nazionale dei Lincei*, Rome March 2004
60. Dam Engineering Newest Challenges; *University of Rome, La Sapienza* Oct. 2003
59. Numerical Simulation of Concrete Deterioration, *Italcementi*, Bergamo, July 2003.
58. Fracture Mechanics of FRP Repair, *University of Lecce*, July 2003.
57. 3D Nonlinear Dynamic Analysis of Dams, *University of Grenoble*, March 2003.
56. Deterioration of Reinforced and Massive Concrete; *University of Grenoble*, March 2003.
55. Numerical Simulation of Concrete Deterioration, *Swiss Federal Institute of Technology*,

- Lausanne, July 2002
54. 3D Nonlinear Dynamic Analysis of Concrete Dams, Tsinghua University, Beijing, PRC, Aug. 2002
 53. Fracture Mechanics of Concrete Dams, China Yangtze Three Gorges Project Development Corp., and China Three Gorges University, Yichang, PRC, Aug. 2002
 52. 3D Nonlinear Dynamic Analysis of Concrete Dams, China Institute of Water Resources and Hydropower Research (IWHR), Beijing, PRC, Aug. 2002
 51. Numerical Simulation of Concrete Deterioration, *University of Venice*, June 2001.
 50. Fracture Mechanics of Dams, *Politecnico of Milan*, June 2001.
 49. Fracture Mechanics of Dams, *Tokyo Electric Power Company (TEPCO)*, Tokyo, Japan, October 1999.
 48. Reflections on, and Applications of Fracture Mechanics in Concrete. *Politecnico di Milano*, Dec. 1998.
 47. Fiber Optics Based Determination of Strains Around the Fracture Process Zone in Concrete WST. *Swiss Federal Institute of Technology*, Lausanne December 1998.
 46. Dynamic Uplift Pressures in Dams under Earthquakes, *Swiss Federal Institute of Technology*, Zurich June 1998.
 45. Numerical Simulation of Concrete Bridge Deck Deterioration, *Prof. Z. Bažant's 60th Birthday Anniversary Workshop* in Prague, March 1998
 44. Applications of Fracture Mechanics in Structural Engineering, *University of Leipzig*, Nov. 1997.
 43. Fracture Mechanics of Concrete Dams, *ENEL/CRIS Milan Italy*, Nov. 1997.
 42. Numerical Simulation of Concrete Bridge Deck Deterioration, *Ecole Normale Supérieur de Cachan*, France, Oct. 1997.
 41. 4th International Benchmark Workshop on Numerical Analysis of Dams, (Organized by ICOLD), Madrid, Sept. 1996 (Round Table)
 40. Fracture Mechanics of Concrete Dams, *Central Research Institute of the Japanese Electric Power Industry*, Chiba, Japan, Nov. 5. 1993.
 39. Fracture Mechanics of Concrete, *Obayashi Construction Company*, Tokyo, Japan, Nov. 4, 1993.
 38. Water Fracture Interaction in Concrete, *Norwegian Institute of Technology (NTH)*, Trondheim, Norway, July 1993.
 37. Fracture Mechanics of Concrete, *University of Rome, La Sapienza*, July 1992.
 36. Fracture Mechanics Research on Dam Cracking; *B.C. Hydro*, Vancouver; Oct. 16, 1992.
 35. Fracture Mechanics of Concrete Dams, *Universidad Politecnica de Madrid*, July 1992.
 34. Fracture Mechanics of Concrete Dams, *Ecole Normale Supérieure de Cachan*, Paris, France, March 1992.
 33. Int. Conference on Fracture of Concrete, Breckenridge, CO 1992.
 32. Fracture Mechanics of Concrete, *ISMES*, Bergamo, July 1990.
 31. Fracture of Dams, *Tsinghua University*, Beijing, April 1990.
 30. Fracture Mechanics of Concrete Dams, *Institute of Water Conservancy and Hydroelectric Power Research*, Beijing, April 1990.
 29. Fracture of Concrete, *Swiss Cement Industry Research institute*, Wildegg, March 1990.

28. Fracture Mechanics of Dams, *Laboratoire Central des Ponts et Chaussées*, Paris, March 1990.
27. Fracture Mechanics of Concrete Dams, *ACRES International*, Niagara Falls, Canada, Dec. 7-8 1989.
26. Fracture Mechanics of Concrete Dams, *University of California*, Berkeley, Nov. 6 1989.
25. Fracture Mechanics of Concrete, *Colorado State University*, April 1989.
24. Fracture Mechanics of Concrete Gravity Dams, *Bureau of Reclamation*, Denver, March 1989.
23. Fracture Mechanics of Concrete Gravity Dams, *Northwestern University*, March 1989.
22. Fracture Mechanics of Concrete Gravity Dams, *EPRI Electric Power Advisory Group*, Chattanooga, TN, March 1989.
21. Fracture Mechanics of Concrete Gravity Dams, *Polytechnic of Madrid*, November, 1987.
20. Fracture Mechanics of Concrete Gravity Dams, *CRIS/ENEL*, July 1987, Milan, Italy.
19. Fracture Mechanics of Anisotropic Rock cutting, *Dowell-Schlumberger Research laboratory*, Tulsa, OK.
18. Computer Graphics in Structural Design, *King Faisal University*, Saudia-Arabia, march 18-23, 1986.
17. Some Engineering Applications of Fracture Mechanics, *Waterways Experimental Station*, Vicksburg, MS. Sept. 20-24, 1985.
16. Development of a mixed smeared and discrete crack model for concrete and geomaterial, *Dept. of Civil Engineering, Swiss Federal Institute of Technology*, Lausanne, Switzerland, June 1-15, 1983, June 1-15, 1984.
15. Finite Element Simulation of Crack Propagation, *Eidgenoessisches Institut fuer Reaktor-forschung (EIR)*, Schaufhausen, Switzerland, July 30, 1982.
14. Finite Element Modeling of R/C using fracture mechanics, *Instituto Sperimentale Modelli e Strutture (ISMES)*, Bergamo, Italy, July 1982.
13. Finite Element Simulation of Crack Propagation *Swiss Federal Institute of Technology*, lausanne, Switzerland, July 9, 1982.
12. Automated Nonlinear Finite Element Analysis of Reinforced Concrete; a Fracture Mechanics Approach, *Swiss Federal Institute of Technology*, Zurich, Switzerland, June 21, 1981.

Consulting Activities

1. Weidlinger & Assoc., New-York.
2. New-York City Department of Environmental Protection (through Gannett Fleming), Gilboa Dam.
3. Bayern-Chemie GmbH, Aschau/Inn, Germany
4. Iran Water Power Company (Karun 4 dam), Teheran, Iran.
5. Edison Ellettricità, Turin, Italy.
6. Electricité de France, Paris
7. Obayashi Corporation, Japan

8. Tokyo Electric Power Service Company, Japan
 9. US Bureau of Reclamation
 10. Hilti Corporation, Lichtenstein.
 11. Schnabel Engineering, Denver, CO
 12. Swiss Dam Safety Authority, Berne, Switzerland
 13. ISMES, Bergamo, Italy
 14. ESI, Paris, France
 15. PCS Mining, Saskatoon, Canada.
 16. ACS Martin, L. A., CA
 17. Hanna Mining, Cleveland, OH
 18. General Dynamics, Fort-Worth TX
 19. TERRA-TEK INC., Salt-Lake City, UT
 20. CTICM, Paris, France
 21. Southern Utility Company
 22. US Army Corps of Engineers
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Society Membership

1. United States Society on Dams, USSD.
 2. (Founding member) Swiss Society of Living Organ Donors (*Association Suisse des Donneurs Vivants d'Organe*)
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Past Committee Membership

1. ACI-ASCE Committee 447, Finite Element Analysis of Reinforced Concrete Structures.
 2. RILEM QFS Committee on Size Effect and Scaling of Quasibrittle Fracture
 3. **Chairman**, ACI-118, Use of Computers, 1990-1993.
 4. **Board Member**, International Association of Fracture Mechanics of Concrete Structures (IA-FraMCoS)
 5. Past US Army Corps of Engineers, (Computer Aided Structural Engineering program) group on Massive Concrete Structures; and its subgroup on Arch Dam.
 6. ACI-E705, Educational Computer Activities.
 7. ACI-446, Fracture Mechanics.
 8. ASCE Technical Council on Computer Practices.
 9. RILEM-TC 90 (Fracture Mechanics; Concrete Applications).
 10. ASCE Task Committee on Parallel and Distributed Processing and Supercomputing.
 11. ASCE Committee on Optimal Design
 12. Society for Experimental Mechanics (Concrete and Rock Fracture).
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Reviewer for

1. National Science Foundation
 2. American Concrete Institute
 3. ASCE, J. of Engineering Mechanics
 4. ASCE J. of Structural Engineering
 5. ASCE J. of Engineering Materials
 6. ASME Journal of Applied Mechanics
 7. International Journal of Solids and Structures
 8. International J. of Numerical Methods in Engineering
 9. Journal of the American Ceramic Society
 10. Journal of Earthquake Engineering and Structural Dynamics
 11. Cement and Concrete Research
 12. Int. Journal of Fracture Mechanics
 13. Engineering Fracture Mechanics
 14. National Science and Engineering Research Council, Canada
 15. Italian Ministry of Research and University (MIUR)
 16. European Journal of Earthquake Engineering
 17. European Journal of Mechanics
 18. Indian Society of Earthquake Technology Journal
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Session Chairman

1. Chairman of the "Thermal and vapor effects and cracking" session in the Conference on Concrete Structures Under Severe Conditions (CONSEC07), Tours, June 2007.
2. 39th US Japan Joint Panel Meeting on Wind and Seismic Effects (by Invitation only), Tsukuba, Japan, 2007.
3. Co-Chairman, WG-3 "Dissemination of Knowledge, Education and Training in a Distributed Environment", *2nd World Forum on Collaborative Research in Earthquake Engineering An Invitational Workshop*, Ispra, March 2007.
4. Chairman, Session 4, CONSEC 04 Fourth International Conference on Concrete under Severe Conditions of Environment and Loading, Seoul, June 2004

5. Chairman, Session 8, Size Effect, Fracture Mechanics of Concrete Structures, Cachan May, 2001.
 6. Chairman Session VIII, , Europe-US Workshop on Fracture and Damage in Quasibrittle Structures, Prague Sept. 1994.
 7. Chairman, Session 2-B, International Conference on Fracture Mechanics of Concrete Structures, Breckenridge, CO, June 1992.
 8. Chairman, Session on Fracture of Dams, ACI Convention, 1991.
 9. Chairman, Session II, International Workshop on Application of Fracture Mechanics to Dam Engineering, Lucarno Switzerland, Sept. 1990.
 10. Chairman, Session Xb, Int. Conf. on Computer Aided Analysis and Design of Concrete Structures, Zell-Am-See, Austria, April 1990.
 11. Chairman, Session H2, Fracture and Strain Softening I, 8th Int. Conf. on Structural Mechanics in Reactor Technology, Brussels, August 1985.
 12. Chairman, Process Zone Session, International Conference on Fracture Mechanics of Concrete and Rock, Vienna, July 1988.
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Conference Advisory Panels

1. Fifth International Conference on Concrete under Severe Conditions Environment and Loading, Tours, France, (2007) Member of the Scientific Committee.
2. FramCos-6, Cagliari 2007, Member of Scientific Board.
3. ICFXI International Conference on Fracture mechanics, Torino, 2005.
4. CONSEC 04 Fourth International Conference on Concrete under Severe Conditions of Environment and Loading, Seoul, June 2004
5. Third International Conference on Fracture Mechanics of Concrete Structures (FRAMCOS-3), Gifu Japan, Oct. 1998.
6. Fracture Mechanics for Hydroelectric Power Systems Symposium, Vancouver September 1-2, 1994
7. International Workshop on Dam Fracture and Damage, Chambéry, France, March 16-18, 1994, **Co-Organizer** with Mazars and Bourdarot.
6. International Workshop on Size Effect in Concrete Structures, Sendai, Japan, Oct. 31-Nov. 2, 1993.
7. International Conference on Computational Contact Mechanics, Southampton, UK, Sept. 1993.
8. International Conference on *Fracture Mechanics of Concrete Structures*, Coordinator, Breckendridge, CO 1992.
9. International Conference on *Dam Fracture*, **Co-Organizer** with R. Dungar, Boulder CO, Sept. 11-13, 1991. 100 Participants from 18 countries.
10. International Workshop on *Application of Fracture Mechanics to Dam Engineering*, **Co-Organizer** with R. Dungar and F. Whittmann, Lucarno Switzerland, Sept. 17-18, 1990.
11. International Conference on *Micromechanics of Failure of Quasi-Brittle Materials*, New-Mexico, June 1990.

12. Second International Conference on *Computer Aided Analysis and Design of Concrete Structures*, Zell Am See (Austria), April 1990.
 13. International Conference on *Fracture of Rock and Concrete*, Houston, June 1987.
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Host for External Visitors

9. Gregory Lebon, Ecole Normale Supérieure de Cachan, April-July 2006.
8. Al-Mahaidi, Riyadh, Monash University Australia, 9 months, 2000-2001.
7. Linner, Jens, Chalmers University, 2 months 1995.
6. Slovik, V., ETH, Zurich, 2 years, 1992-94
5. Dave Dollar, US Bureau of Reclamation, Denver (1991-1992, part time)
4. Plizzari, G., University of Brescia/ISMES, Italy, Research Associate, 12 Months, 1991-1992
3. Thiel, F., Ecole Central/Framatome, Paris, France, VSN, 16 months, 1991-1992.
2. Brühwiler, E., ETH Zurich, Switzerland, Research Associate 2 years, 1989-1990.
1. Kim, I., Pusan University, S. Korea, Sabbatic leave, 1 year, 1988.

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