Emir José Macari

Dean and Professor
College of Engineering and Computer Science
California State University – Sacramento

I. EDUCATIONAL BACKGROUND

Ph.D.	1989 University of Colorado at Boulder	Civil Engineering– Geomechanics
M.S.C.E.	1982 University of Colorado at Boulder	Civil Engineering- Geomechanics
B.S.C.E.	1979 Virginia Tech (VPI&SU)	Civil Engineering

II. ACADEMIC EMPLOYMENT HISTORY

- Dean & Professor, College of Engineering and Computer Science, California State University, Sacramento; 2006-Present; Director of the California Smart Grid Center 2008-present
- Dean & Professor, College of Science, Technology and Mathematics, University of Texas at Brownsville 2004-06
- Program Director, Centers of Research Excellence in Science and Technology, CREST, National Science Foundation, NSF, IPA from LSU, 2001-02
- Chairman and Bingham C. Stewart Distinguished Professor and/or Associate Professor, Department of Civil and Environmental Engineering, Louisiana State University, 1999-2004
- Associate Professor, Civil & Environmental Engineering, Georgia Institute of Technology, Joint Appointment with School of Public Policy, Georgia Institute of Technology, 1993-1999
- Assistant and Associate Professor, and Director of the Civil Infrastructure Research Center, Civil Engineering, University of Puerto Rico, 1990-1993
- Research Fellow, NASA; Marshall Space Flight Center, Summers 1990-1991 and 2003
- NASA Fellow and Research Associate, CU Boulder, 1985-1989

III. INDIVIDUAL STUDENT GUIDANCE

1. Ph.D. Student Guidance

1. Pedro Arduino Associate Professor, University of Washington, Seattle, WA Sept 1997
   Dissertation Title: "Formulation of a Mixture-Theory Based Finite Element Approach for the Assessment of Liquefaction in Granular Materials"

2. Laureano Hoyos Associate Professor, University of Texas at Arlington, Dec 1999.
   Dissertation Title: "Mechanical Response of Partially Saturated Residual Soils"

3. Yong Shao Senior Design Engineer, TENSAR Corporation, Atlanta, GA
   Dissertation Topic: "Back-Analysis Modeling of Soils in Deep Excavations"

4. Tim Wyatt Director of Blasting Division, Applied Research Associates (ARA), NC
   Dissertation Topic: "Development and Evaluation of an Educational Software Environment for Geotechnical Engineering"

5. Pawan Divakarla Research Scientist and Principal, GIS Consultant Engineers, Atlanta, GA
   Dissertation Title: "Rain Induced Landsliding – GIS Based System"

6. Taecil Choi Research Professor – Seoul University, South Korea
   Dissertation Topic: "Pile freeze modeling in cohesive saturated soils"

7. Prasad Samarajiva Structural/Geotechnical Engineer – Walter Moore, Houston, TX
   Dissertation Topic: "Development of Unified Model for Granular Materials"

8. Jingsong Wu Transferred to MIT Summer 1998.
   Graduated with M.S. Spring 1998.
   Dissertation Topic: "Lagrangian FEA of the Mixture Theory for Soils"

9. Tongyan Pan Transferred to University of Illinois co-advisor Dr. Wang
   Graduated with M.S. Spring 2002
   Thesis Topic: "Image Analysis Based study of Pavement Materials"

2. M.S. Students Guidance

- Edith Camacho — Current Student
  Research Project: "Use of Geosynthetics for Infrastructure Projects"
- Orlando Boscan — Graduated: Fall, 2003
  Thesis: "Mechanical properties of granular materials under multiaxial loading"
- Carlos Ortiz — Graduated: Winter, 1997
  Research Project: "Design and Construction of Sanitary Landfills and Environmental Remediation Technologies"
- Morgan NeSmith — Graduated: Fall, 1996
  Thesis: "Development of a Computer Controlled Cubical Cell Testing Device"
- Francisco Doñez [1] — Graduated: Spring, 1996 (Co-Advisor with Dr. Anne Bostrom)
  Thesis: "Sustainability Indicators for Rural Industrialization in Latin America"
- Valasis Vafiadis — Graduated: Fall, 1995
  Research Project: "Development of a Direct Simple Shear Device for a Virtual Reality Geotechnical Laboratory"
- Susan Wright [1] — Graduated: Fall, 1995 (Co-Advisor with Dr. F. Michael Saunders)
  Research Project: "Metrics for Industrial Ecology - A Decision-Making Tool to Approach Sustainability"
- Jen Moldaschel [1] — Graduated: Spring, 1996 (Co-Advisor with Dr. F. Michael Saunders)
  Research Project: "Quantifying Sustainability - A Case Study in the Carpet Industry"
- Taecil Choi — Graduated: Winter, 1996
  Research Project: "Prediction of the Response of Partially Saturated Soil"
- Seung-Yoo Lee — Graduated: Winter, 1996
  Research Project: Experimental and Modeling Issues of OC Clays"
- Laureano Hoyos - Graduated: Winter, 1993
  Thesis: "Dynamic Properties of Residual Soils with the Resonant Column Device"
- José Pérez - Graduated: Winter, 1993
  Thesis: "Characterization of Granular Materials for Lunar Bases"
- Pedro Arduino - Graduated: Fall, 1992
  Thesis: "Elasto-Plastic Characterization of Granular Materials"
- Aurelio Gutierrez - Graduated: Fall, 1992, (Co-Advisor with Dr. Juan B. Bernal)
  Thesis: "Assessment of Deep Foundations for Puertorican Soils"
- Roberto Jamett - Graduated: Winter, 1991, (Co-Advisor with Dr. Mikolaj Wezkygzn)
  Thesis: "Development of Pore Water Pressure in Residual Soils"

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1 Student in the School of Public Policy – Environmental Policy

Continuing Education Short Courses

- **"Environmental Remediation Technologies for Contaminated Soil and Ground Water"**

  This short course was offered to the Graduate students and Faculty members of the Department of Chemistry and Chemical Engineering at the National University of the South in Bahia Blanca, Argentina. The course was a one-week - 45 lecture hours with term projects and accredited by the university as counting for the MS and PhD programs in Chemistry and Chemical Engineering. 2/97. Also offered at the University of Guadalajara, May 7 and 8, 2003.

- **"Design, Construction, and Monitoring of Sanitary Landfills"**

  This was a series of short courses that were organized by the Center for Hemispherical Cooperation in Research and Education in Engineering and Applied Science at the University of Puerto Rico at Mayagüez and the Caterpillar Corporation. (In Spanish)

◊ 2 day short course in Guadalajara, Mexico, August 5-6, 1996, attended by 55 people.

◊ 2 day short course in Lima, Peru, August 8-9, 1996, attended by 95 people.

◊ 2 day short course in Bogota, Colombia, August 12-13, 1996, attended by 185 people.

◊ 2 day short course in Sao Paulo, Brazil, April 2-3, 1997, attended by 159 people. (In Portuguese)

◊ 2 day short course in Asuncion, Paraguay, August 7-8, 1997, attended by 45 people.

◊ 2 day short course in La Paz, Bolivia, August 11-12, 1997 attended by 105 people.

Participation in these courses included: engineers, professors, graduate and undergraduate students, municipal and regional environmental legislators, as well as the scientific and local media.

- **"Introduction to Geotechnical Engineering for Transportation Applications"**

This was a series of short courses organized by the Technology Transfer in Transportation Center at the University of Puerto Rico at Mayagüez with funding from the U.S. and the Puerto Rico Departments of Transportation.

◊ 2 day short course in St. Thomas, U.S. Virgin Islands (English) September 5-6, 1991

◊ 2 day short course in Ponce and Mayagüez, Puerto Rico (Spanish) August 28-29, 1990

Engineers attended these courses from the regional offices of the department of transportation and the highway authority and well as consulting engineers. Estimated attendance was between 30 and 40 people.

- **"Advanced Concepts of Geotechnical Engineering for Transportation Applications"**

This series of short courses were organized by the Technology Transfer in Transportation Center at the University of Puerto Rico at Mayagüez with funding from the U.S. and the Puerto Rico Departments of Transportation.

◊ 3 day short course in St. Thomas, U.S. Virgin Islands (English), September 9-11, 1992

◊ 2 day short course in Mayagüez, Puerto Rico (Spanish), November 10-11, 1992

Engineers attended these courses from the regional offices of the department of transportation and the highway authority and well as consulting engineers. Estimated attendance was between 30 and 40 people.

IV. INTELLECTUAL PRODUCTS

A. PUBLISHED BOOKS OR BOOK CHAPTERS

1. Macari, E.J., and Hoyos, L.R., "A Study of Earthquake Induced Liquefaction in Western Puerto Rico using GIS Technology", ***Geological Society of America Special Book,*** "Active tectonics and seismic hazards of Puerto Rico, the Virgin Islands, and offshore areas", eds. P. Mann and C. Prentice, 2005.

2. Macari, E.J. and Ortíz-Gómez, C.H., "Impermeable Barrier Liners in Containment Type Landfills", Chapter in "*Environmental Biotechnology and Cleaner Bioprocesses*," Eds. Olguin, E., Sanchez, G., and Hernandez, E., Taylor & Francis Group, Ltd., London, England, pp. 55-61.

3. Macari, E.J. and Saunders, F.M., Eds. ***"Environmental Quality, Innovative Technologies, and Sustainable Economic Development - A NAFTA Perspective,"*** ASCE Environmental Division Special Technical Publication, Proceedings of NSF, DOE, CONACyT, and NSERC Sponsored Conference, Mexico City, Mexico, p. 143, 1997.

4. Macari, E.J., Frost, J.D., Pumarada, L., Eds. ***"Geo-Environmental Issues Facing the Americas,"*** ASCE Geotechnical Special Technical Publication # 47, Proceedings of the NSF/PRIDCO Sponsored Workshop, Mayagüez, Puerto Rico, p. 201, 1995.

B. PEER-REVIEWED PUBLICATIONS

1. Flores, R., Ramirez, M. and Macari, E.J. (2010) "Internal Erosion and Rehabilitation of an Earth-Rock Dam", ***ASCE Journal of Geotechnical and Geoenvironmental Engineering***, February, 2011.

2. Queiroz R. and Macari, E.J. (2009) "Geotechnical and Structural Behavior of the Railroad Track in Large-scale Apparatus", 17th ICSMGE-Alexandria, Egypt

3. Shao, Y. and Macari, E.J., "Information Feedback Analysis in Deep Excavations", **ASCE** ***International Journal of Geomechanics,*** Volume 8, Issue 1, pp. 91-103 (Jan/Feb 2008)

4. Benavides, J.A. and Macari, E.J. (2006). "Risk Assessment and Hazard Mitigation Planning near the Gulf Coast Region of the U.S. / Mexico Border: A Brownsville, Texas Case Study for the 2005 Hurricane Season", International Conference on Challenges in Coastal Hydrology and Water Quality, Baton Rouge, LA.

5. Shao, Y., Macari, E.J., and Cai, W., "Compound Deep Soil Mix Pile for Retaining Structure for Excavations", ***ASCE Journal of the Geotechnical Engineering***, Volume 131, Issue 11, November 2005, pp. 1370-1377.

6. Samajariva, P., Wathugula, W. and Macari, E.J., "Genetic Algorithm for the Calibration of an Elasto-plastic Constitutive Models", **ASCE** ***International Journal of Geomechanics***, Volume 5, Issue 3, Sept. 2005, pp 206-217.

7. Macari, E.J., Hoyos, L.R. and Arduino, P., "Computational Modeling of Unsaturated Soils under Multiaxial Stress States", ***International Journal of Plasticity,*** Volume 19, Issue 10, October 2003, Pages 1481-1515.
8. Hoyos, L.R.; Arduino, P.; and Macari, E.J. (2003). "Modeling elasto-plastic behavior of unsaturated soil using a controlled suction cubical test cell". Constitutive Modeling of Geomaterials, **CRC Press**, 165-172.
9. Hoyos, L.R.; Arduino, P.; and Macari, E.J. (2003). "Modeling Unsaturated Soil Response on the Deviatoric π plane", Applications of Computational Mechanics in Geotechnical Engineering", Ouro Preto, Brazil, Eds. Azevedo, Vargas, Sousa and Fernandes, 283-288.
10. Hoyos, L.R.; Arduino, P.; and Macari, E.J. (2003). "Experimental and Computational Modeling of Elasto-Plastic Constitutive Behavior of an Unsaturated Soil under True Triaxial Stress States", ASCE Engineering Mechanics 2003, Seattle, WA. July 2003.
11. Macari, E.J., Silva, C. and Hoyos, L. (2002). "A Stress/Suction Controlled True Triaxial Testing Device for Unsaturated Soils", Unsaturaded 2002, Vol. 3 Recife, Brazil.
12. Silva, C., Porras, O., Fratta, D. and Macari, E.J., "Mechanical Response of Unsaturated Particulate Materials – A Stiffness Assessment Study under Controlled Matric Suction", Proceedings of 2002 IMECE, ASME Conference, New Orleans, LA, Nov 2002
13. Choi, T. and Macari, E.J., "Dynamic Finite Element Analysis of Pile-Porous Media Interaction", Accepted, Proceedings of EM2002, ASCE Engineering Mechanics Division, New York, N.Y., June 2002.
14. Arduino, P. and Macari, E.J., (2002) Closure to Discussion of Arduino and Macari, "Numerical Analysis of Geomaterials within Theory of Porous Media" ASCE *Journal of Engineering Mechanics Division*, Vol. Vol. 128, No. 6, June 2002, pg. 708.
15. Wang, L.-B., Macari, E.J. and Woldesenbet, E., "New Micromechanics Formulations for the Assessment of Elastic Moduli in Granular Materials", Proceedings of ETCE, American Society of Mechanical Engineers, Houston, TX., February 4-5, 2002.
16. Samarajiva, P.M. and Macari, E.J., "Disturbed State Model for Granular Materials", Sixth U.S. National Congress on Computational Mechanics, Dearborn, MI, August 1-4, 2001.
17. Macari, E.J., Samarajiva, P.M. and Wathugula, G.W., "Constitutive Modeling of Cohesionless Granular Materials Using Disturbed State Concept", ASCE Engineering Mechanics Conference, San Diego, CA, June 26-29, 2001.
18. Macari, E.J., "A GIS-Based Approach to Rain-Induced Landslide Hazard Assessment in Western Puerto Rico", ***International Journal of Natural Hazards and Civil Infrastructure***, Span. Vol 1, No. 2, December 2001, pp. 117-126.

19. Hoyos, L.R. and Macari, E.J., "Development of a Stress/Suction-Controlled True Triaxial Testing Device for Unsaturated Soils," *American Society for Testing and Materials**, Geotechnical Testing Journal***, GTJODJ, Vol. 24, March 2001, pp. 5-13.
20. Macari, E.J. and Hoyos, L.R., "Mechanical Behavior of an Unsaturated Soil Under True Triaxial Stress States," *American Society for Testing and Materials**, Geotechnical Testing Journal***, GTJODJ, Vol. 24, March 2001, pp. 14-22.
21. Arduino, P. and Macari, E.J., "Implementation of Porous a Media Formulation for Geomaterials," ***ASCE Journal of Engineering Mechanics***, Vol. 127, No. 2, February 2001, pp. 157-166.
22. Arduino, P. and Macari, E.J., "Numerical Analysis of Geomaterials within the Theory of Porous Media," ***ASCE Journal of Engineering Mechanics***, Vol. 127, No. 2, February 2001, pp. 167-175.
23. Wyatt, T.R. and Macari, E.J., "Effectiveness Analysis of Subsurface Drainage Features based on Design Adequacy", ***Journal of Transportation Research Record***, *Transportation Research Record # 1709, Geotechnical Aspects of Pavements 2000*, Nov. 2000, pp. 69-77.
24. Hoyos, L.R. and Macari, E.J., "Nature of Principal Strain Response of Unsaturated Soils Under Multiaxial Stress States", "Advances in Unsaturated Geotechnics", ASCE/Geo-Institute ***Special Technical Publication #99***, C.D. Shackelford, S.L. Houston, and N-Y Chang, Eds. pp. 333-343, Geo-Denver 2000.
25. Wyatt, T.R., Arduino, P. and Macari, E.J., "Assessment of a Virtual Laboratory for Geotechnical Engineering," ***Computing in Education Journal***, *American Society of Engineering Education*, Vol. X, No. 2, April-June 2000, pp. 27-35.
26. Wyatt, T.R. and Macari, E.J., "Learner-Centered Educational Software for Constitutive Modeling of Soils", ***Multimedia and Computers in Mechanics***, *American Society of Engineering Education*, Charlotte, N.C., June 1999.
27. Divakarla, P. Hoyos, L., and Macari, E.J., "Stability analysis of slopes in western Puerto Rico – A GIS Approach," *Stability of Natural Slopes in the Coastal Plain*, ***Geotechnical Special Publication # 77***, ASCE/Geo-Institute, Martin, Ed., pp. 59-68.
28. Shao, Y., Zhang, C. and Macari, E.J., "The application of deep soil mixing piles in deep excavations," *Soil Improvement for Big Digs*, ***ASCE Special Technical Publication # 81***, ASCE/Geo-Institute, Maher & Yang, Eds., pp. 84-95.
29. Shao, Y. and Macari, E. J., "The Study of Ground Water Control Associated with Deep Excavations," *Geotechnics of High Water Content Materials, **ASTM STP 1374***, T. B. Edil and P. J. Fox, Eds., American Society for Testing and Materials, 1999.
30. Hoyos, L.R., Jr. and Macari, E.J., "Influence of In-Situ Factors on the Dynamic Response of Piedmont Residual Soils," ***ASCE Journal of Geotechnical and Geoenvironmental Engineering Division***, Vol. 125, No. 4, April, 1999, pp. 271-279.

31. Arduino, P. and Macari, E.J., "Numerical Modeling of Spread Footings at Bridge-Embankment Interfaces," ***Transportation Research Record*** 1633, *Liquefaction, Differential Settlement, and Foundation Engineering,* NRC, National Academy Press, pp. 61-67, 1998.
32. Divakarla, D., Hoyos, L. and Macari, E.J., "Assessment of Liquefaction Potential in Western Puerto Rico," ***ASCE Special Technical Publication****, Geotechnical Earthquake Engineering and Soil Dynamics, ASCE, Geo-Institute*, August 1998.
33. Shao, Y. and Macari, E.J., "Finite Element Analysis for Designing Braced Diaphragm Walls," ***Computer Methods and Advances in Geomechanics***, Nov., 1997, A.A. Balkema Publishers.
34. Macari, E.J., Weihe, S., and Arduino, P., "Implicit Integration of Elasto-Plastic Constitutive Models with Highly Nonlinear Hardening Functions," ***International Journal of Mechanics of Cohesive-Frictional Materials***, John Wiley and Sons, Vol. 2, March 1997, pp. 1-29.
35. Arduino, P., Op den Bosch, A. and Macari, E.J., "Geotechnical Triaxial Soil Testing in a Virtual Environment," ***Journal of Computing in Civil Engineering****, American Society of Civil Engineers*, Vol. 11, No. 1, January 1997, pp. 44-47.
36. Macari, E.J., Parker, J.K., and Costes, N.C., "Measurement of Volume Changes in Triaxial Tests using Digital Imaging Techniques," ***Geotechnical Testing Journal***, American Society for Testing and Materials, Vol. 20, No. 1, March 1997, pp. 103-110.
37. Macari, E.J. and Hoyos, L.R., "Effects of Weathering on the Dynamic Properties of Residual Soils," *American Society of Civil Engineers,* ***Journal of Geotechnical Engineering***, Vol. 122, No.12, pp. 988-997, December 1996.
38. Al-Shibli, K., Macari, E.J., and Sture, S., "Digital Imaging Techniques for the Assessment of Homogeneity and Isotropy in Granular Materials," ***Transportation Research Record*** **1526**, *Emerging Technologies in Geotechnical Engineering*, National Research Council, National Academy Press, December 1996, pp. 121-128.
39. Macari, E.J. and Arduino, P., "Overview of State-of-Practice- Modeling of Overconsolidated Soils," ***Transportation Research Record*** **1479***, Engineering Properties and Practice in Overconsolidated Clays*, NRC, National Academy Press, August 1995, pp. 51-60.
40. Frost, J.D., Tsai, J., Jang, D., and Macari, E.J., "Designing Intelligent Environmental Site Assessments," *Geo-Environmental Issues Facing the Americas*, **ASCE** ***Geotechnical Special Publication #47***, April 1995, pp. 79-82.
41. Macari-Pasqualino, E.J., Closure to the Discussion of Macari-Pasqualino, et al., "Response Prediction of Granular Materials Under Low Effective Stresses," *American Society of Civil Engineers, Journal of Geotechnical Engineering*, Sept. 1995, Vol. 121, No. 9, pp. 678-680.

42. Arduino, P., Macari, E.J., and Gemperline, M., "Load-Settlement Prediction of Footings on Steep Slopes," ***ASCE Geotechnical Special Publication #40,*** *Vertical and Horizontal Deformations of Foundations and Embankments*, June 1994, Vol. 2, pp. 1385-1399.
43. Macari-Pasqualino, E.J., Runesson, K., and Sture, S., "Response Prediction of Granular Materials Under Low Effective Stresses," *American Society of Civil Engineers,* ***Journal of Geotechnical Engineering***, July 1994, Vol. 120, No. 7, pp. 1252-1269.
44. Macari, E.J. and Ko, H.-Y., "Anisotropic Characteristics of an Overconsolidated Silt by Resonant Column Testing," *American Society for Testing and Materials,* ***ASTM Geotechnical Testing Journal***, September 1994, Vol. 17, No. 3, pp. 315-324.
45. Sture, S., Runesson, K., and Macari-Pasqualino, E.J., "Analysis and Calibration of a Three-Invariant Plasticity Model for Granular Materials," ***Ingenieur - Archiv***, Archive of Applied Mechanics, Springer International, January 1989, Vol. 59, No. 3, pp. 253-266.
46. Hoyos, L.R. and Macari, E.J., Closure to Discussion of Hoyos and Macari, "Influence of In-Situ Factors on the Dynamic Response of Piedmont Residual Soils," ***ASCE Journal of Geotechnical and Geoenvironmental Engineering Division***, Vol. 125, No. 4, April, 1999, pp. 271-279.
47. Hoyos, L.R. and Macari, E.J., Discussion to paper Borden, R. "Dynamic Characteristics of Piedmont Residual Soils", ***American Society of Civil Engineers, Journal of Geotechnical Engineering***, December 1996, Vol. 122, Number 12, June 1998.
48. Queiroz, R. and Macari, E.J., "Full-scale Testing of Railway Infrastructure under Realistic Loading", XX Panamerican Railway Congress, 18/22 September 2000 – Havana, Cuba.
49. Queiroz, R., Macari, E. and Tumay, M., "Use of Cone Penetrometer Technology for the Assessment of Railway Infrastructure", XX Panamerican Railway Congress, 18/22 September 2000 – Havana, Cuba.
50. Hoyos, L. R., Macari, E.J. and Arduino, P., "True triaxial constitutive behavior of unsaturated soils", *13th Engineering Mechanics Conference, ASCE*, Baltimore, MD, June 1999.
51. Krastanov, G., Zettler, A.H., Macari, E.J. and Haj-Ali R., "Constitutive Modeling for Clay Behavior Using Neural Networks," *Engineering Mechanics, ASCE*, Baltimore, MD, June 1999. ***Best Student Paper Award***.
52. Wyatt, T.R., Baker, N., and Macari, E.J. "Knowledge-based failure diagnosis of earth retaining structures," Proceedings of the First International Conference on New Technologies for Decision Making in Civil Engineering, University of Quebec, Montreal, Canada, 10,98

53. Divakarla, P. and Macari, E.J., "GIS-Based Assessment of Rain-Induced Landslides," Proceedings of the First International Conference on New Technologies for Decision Making in Civil Engineering, University of Quebec, Montreal Canada (October 1998).
54. Arduino, P. and Macari, E.J., "Numerical Study of Geomaterials in the Light of Modern Theories of Porous Media", *Proceedings of the International Conference on Poromechanics* celebrating the accomplishments of M. Biot, Belgium, September 1998.
55. Macari, E.J., "Geo-Environmental Concerns in North America", Proceedings of Environmental Quality, Innovative Technologies, and Sustainable Economic Development - A NAFTA Perspective, ***ASCE Special Technical Publication***, 1997, pp. 133-140.
56. Arduino, P. and Macari, E.J., "Multiphase Flow in Deforming Porous Media by the Finite Element Method," *Proceedings of the 1996 ASCE 11th Engineering Mechanics Conference*, Fort Lauderdale, Fla., May 19-22, 1996, Vol. 1, pp. 240-245.
57. Hoyos, L.R. and Macari, E.J., "Dynamic Properties of Residual Soils," *10th Pan-American Conference on Soil Mechanics and Foundation Engineering*, Guadalajara, Mexico, November 1995, Vol. 1, pp. 264-276.
58. D'Andria, G., Frost, J.D., Luna, R., and Macari, E.J., "Boring Log Quality for Spatial Hazard Analyses," 10th *Pan-American Conference on Soil Mechanics and Foundation Engineering*, Guadalajara, Mexico, November 1995, Vol. 3, pp. 1739-1749.
59. Macari, E.J., Frost, J.D., Saunders, F.M., DuBose, J., "Sustainable Technology in Support of Economic Development," ***Georgians on Sustainability***, O.M. Ivey and George Lawes, Editors. Published by the Georgia Environmental Organization and the Institute of Ecology of the University of Georgia, September 1995, pp. 44-52. Reviewed by Editors.
60. Doñez, F. and Macari, E.J., "Potential Role of Remote Sensing for Monitoring and Enforcing Multilateral Environmental Agreements," Proceedings from Conference on Remote Sensing and Environmental Monitoring for the Sustainable Development of the Americas, San Juan, Puerto Rico, March 1995.
61. Macari, E.J., Frost, J.D., and DuBose, J., "Natural Hazards Risk Assessment in the Context of Sustainability - A NAFTA Concern?" Proceedings of the Tri-Lateral Natural Hazards Risk Assessment Conference, Ottawa, Ontario, Canada, February 12-14, 1995.
62. Macari, E.J. and Arduino, P., "Implicit Integration Technique Applied to a Two-Surface Model for Granular Materials," Presented at the 4th Brazilian Computational Mechanics Conference, Rio de Janeiro, Brazil, Nov. 1994, Balkema Editorial, The Netherlands.

63. Macari, E.J., "Deformation of Geomaterials - An Overview of Recent Numerical Modeling Issues," State-of -the-Art presentation and publication in the Proceedings of the US/Scandinavian Cooperation in Geotechnical Engineering Workshop, Trondheim, Norway; June 5-9, 1994, The U.S. National Science Foundation and The Research Council of Norway, Eds. Senneset, K., Schackelford, C. and Strout, J., pp. 49-55.
64. Macari, E.J., Martin, J., and Brandon, T., "Liquefaction Potential of Western Puerto Rico," Proceedings of the NSF sponsored Geographic Information Systems and their Application in Geotechnical Earthquake Engineering, Atlanta, 1993, ASCE, pp. 72-76. Reviewed by Editors.
65. Macari, E.J., Parker, J., and Costes, N.C., "Digital Image Techniques for Volume Change Measurements in Triaxial Tests," ASCE Proceedings of Digital Image Processing: Techniques and Applications in Civil Engineering, NSF/Engineering Foundation Conference, Kona, Hawaii, February 1993, published by ASCE, pp. 211-219. Reviewed by Editors.
66. Macari, E.J., Laymon, C., and Costes, N.C., "Small-Scale Field Experiment of Subsurface Hydrologic Processes with Implications for Rain-Induced Slope Stability Analyses," Proceedings of the *Brazilian Conference on Slope Stability Analysis*, Rio de Janeiro, Brazil, November 1992, Vol. 3, pp. 576-588. Peer-reviewed by committee members.
67. Macari, E.J., "Numerical Modeling and Analysis - Stability and Deformation of Slopes," Proceedings US/Brazil Workshop, Belo Horizonte, Brazil, Nov. 1992, Ed. Nieto, A., Printec Press, pp. 183-187.
68. Laymon, C., Macari, E.J., and Costes, N.C., "Hydrologic Field Instrumentation for a Small-Scale Experiment with Implications for Rain Induced Slope Stability Analysis," US/Brazil Geotechnical Workshop, Belo Horizonte, Brazil, 10/92, Ed. Nieto, A., Printec Press, pp. 79-88.
69. Macari, E.J. and Arduino, P., "Constitutive Behavior of Granular Materials with Implications for Slope Stability Analyses," Proceedings of the NSF Conference, San Juan, Puerto Rico, June 1992, University of Puerto Rico Press.
70. Laymon, C., Macari, E.J., and Costes, N.C., "Plot-Scale Experiments of Surface Moisture-Atmosphere Interactions - with EOS Implications," *ASCE 3rd International Conference on Engineering, Construction and Operations in Space*, Denver, May 1992, pp. 2082-2093.
71. Macari-Pasqualino, E.J., Runesson, K., and Sture, S., "Analysis of Low Effective Stress Characteristics of Granular Materials in Reduced Gravity," *ASCE Geotechnical Engineering Congress*; Boulder, Colorado; June 13-15, 1991, Vol. II, pp. 1222- 1233.

Major Technical Reports

- Macari-Pasqualino, E.J. and Sture, S., "Assessment of Homogeneity and Isotropy in Granular Specimens," UC Boulder Report for the Mechanics of Granular Materials (MGM) Project; November 1988, p. 25.

- Ketcham, S., Macari-Pasqualino, E.J., and Sture, S., "Analysis of the MGM Cylindrical Specimen Subjected to Base Excitation," UC Boulder Report for the Mechanics of Granular Materials (MGM) Project; November 1989, p. 18.

E. INVITED PRESENTATIONS (not included as publications through 1990-2002 only)

ENGINEERING

- "Rain-Induced Landslides – Behavior of Unsaturated Soils in Hillslopes" Invited, University of Tennessee, Knoxville, TN, April 25, 2002.
- "Experimental and Computational Simulation of Unsaturated Soils," Invited Panelist, International Conference on Unsaturated Soils UNSAT2002, Recife, Brazil, March 2002.
- "Inter-granular Forces in Poro-Materials," Third Mexico-Canada conference on Poromechanics, Puerto Vallarta, Mexico, October 1999.
- "The Mechanics of Granular Materials Experiment – STS-79 and STS-89", National Space Society, Atlanta Chapter, Fernbank Science Center, February 19, 1998.
- "Dynamic Response of Saturated Granular Media – Theory of Mixtures," Invited presentation to the faculty and students of Tongji University, Shanghai, China, November 1997.
- "Recent Advances in Computational Geomechanics," Invited presentation to faculty and students of the Geotechnical group at MIT, Cambridge, MA, June 1996.
- "Recent Advances in the Design of Sanitary Landfills," Keynote Presentation at the International Symposium of Clean Technologies and Pollution Control, Boca del Rio, Mexico, March 10-13, 1996.
- "Measurement of Volume Changes in Triaxial Tests using Digital Imaging Techniques," Presentation at the Annual Transportation Research Board meeting. Washington, D.C., 1/96.
- "Simulation of a Cyclic Triaxial Experiment in a Virtual Environment," Proceedings of the NSF sponsored Workshop on Advancements of Supercomputing and Visualization in Earthquake Geotechnical Engineering, Carnegie Mellon University, Pittsburgh, PA. December 15-17, 1994. Invited Presentation.
- "Geotechnical Laboratory in a Virtual Environment," Invited presentation at the Georgia Tech meeting on High-Tech Educational Issues, Edutech, Atlanta, GA., December 1994.

- "Numerical Integration Scheme Applied to a Cone-Cap Model," MEET'N 93, ASCE/ASME, Presentation and Abstract in Proceedings, pp. 107, Charlottesville, VA., June 1993.
- "Design and Analysis of Foundations for Offshore Platforms," Catholic University of Rio de Janeiro, November 1992. Invited Speaker. (In Portuguese)
- "Geotechnical Studies for the Design of Offshore Platforms," University of Veracruz and Veracruz Institute of Technology, October 1992. Invited Speaker. (In Spanish)
- "Lessons Learned from Recent Earthquakes," Instituto Mexicano de Aseguradores y Riesgos, A.C., Mexico City, October 1992. Invited Speaker. (In Spanish)
- "Design and Analysis of Foundations for the Lunar Base," (Diseño y Analisis de Fundaciones para las Bases Lunares), Universidad Autonoma de México, October 1992 Invited Speaker.
- "Technique for Assessing Vegetation-Induced Moisture Flux with Implications for Global Climate Modeling," Presentation in Poster Session, AGU Annual Meeting, San Francisco, California; October 1990.

POLICY

- "Funding Opportunities at NSF in Bio and Information Technology", Invited to Louisiana Board of Regents Annual LA EPSCoR Meeting, Baton Rouge, LA, April, 2002.
- "America Underrepresented in Science and Engineering Research and Education – A Time for Change," Center for Science, Policy and Outcomes annual meeting, Washington, D.C., 1/02.
- "The Effect of the Changing Political Climate on Science, Mathematics and Engineering Diversity," Steering Committee Member and Presenter AAAS/Sloan Foundation Meeting, November, 1995.
- "Sustainable Development in the Americas," Invited, Annual Meeting of SACNAS (Society for the Advancement of Chicanos and Native Americans in Science), El Paso, TX, January, 1995.
- "Natural Hazards in the context of Sustainable Development," Invited presentation at the Tri-Lateral Workshop on Natural Hazards: Towards a Comprehensive Assessment of Risks due to Natural Hazards; Canada, USA, and Mexico, Ottawa, Canada, Feb. 11-14, 1995.
- "Funding Scientific Research in the Post Cold Era," Invited Keynote presentation to the NASA/JOVE annual meeting, Cocoa Beach, Fla., July, 1994.

EDUCATION

- "Power of Mentoring in Science Education," Keynote Address, 8th Biennial Symposium on Minorities, the Medically Under-served and Cancer, sponsored by the

Intercultural Cancer Council and the National Institutes of Health (NIH), February, 2002.

- "The Power of Mentorship in Academia," SACNAS annual meeting, Phoenix, Arizona, 9/01.
- "Affirmative Action at Georgia Tech," Panel member, sponsored by GT Student Government Association, Diversity Forum and VP Student Services, January, 1998.
- "Transition from Graduate School to an Academic Position," Presentation and panel session chair at The GEM Consortium Annual Conference, Detroit, MI, November, 1996.
- "Positive Impact of Affirmative Action on Science and Engineering Education," Presentation, National Organization of Black Chemists and Chemical Engineers, Detroit, MI, March, 1996.
- "Excellence in Hispanic Engineering Education," Presentation at the Annual Conference of the Society of Hispanic Professional Engineers, Seattle, WA, February, 1996.
- "Achieving Excellence in Hispanic Science and Engineering Education," Keynote Presentation the Annual Conference of the Society for the Advancement of Chicanos and Native Americans in Science, SACNAS, Cornell University, Feb.1995.

V. SERVICE

A. PROFESSIONAL CONTRIBUTIONS (1991-2001)

ENGINEERING

- Session chair, ASCE EMD, San Diego, California, June, 2001 "Mechanics of Particulate Media"
- Session organizer and chair, TRB "Embankment-Soil Interface; The bump at the end of the bridge", Washington, D.C., January 1998.
- Session chair, TRB, "Hybrid and Innovative Foundations", Washington, D.C., January 1998.
- Transportation Research Board; Numerical and Physical Modeling of Earth Structures A2K05 Committee Member (1997-present)
- Review Panel Member, National Science Foundation, Education and Human Resources Directorate, Alliance for Minority Participation, December 1997.
- Review Panel Member, National Science Foundation, Engineering Directorate, Career Awards Program, January 1997.
- Review Panel Member, National Science Foundation, Human and Educational Resources, Alliances for Minority Participation, October 1996.

- Member, ASCE Engineering Mechanics Committee on Properties of Materials, 1993 - 2003
- ASCE Journal of Engineering Mechanics - Reviewer, 1993-present
- ASCE Geotechnical Engineering Journal Editorial Board Member, 1992-2000
- Transportation Research Board; Soil and Rock Properties Committee Member (1991-1997)
- Chairman/Organizer - "Environmental Quality, Innovative Technologies, and Sustainable Economic Development - A NAFTA Perspective," Workshop sponsored by the U.S. State Department, NSF, and Sandia National Laboratories, Mexico City, February 8-10, 1996
- Chairman/Organizer - "Digital Imaging Techniques in Highway Applications," Transportation Research Board Meeting, Soil and Rock Properties Committee A2LO2, D.C., January, 1996
- NRC - National Academy of Science - Panel Reviewer of Ford Foundation Fellowships, 97-98
- NSF Panel Reviewer for Instrumentation and Laboratory Improvements Program, April, 1995
- NSF Panel Reviewer for Mechanical and Structural Systems Division, August, 1993
- Session Chair and Organizer: Transportation Research Board; Non-Destructive Evaluation of Subsurface Infrastructure; January, 1993
- Organizer and Session Chair: NSF Grantee's Conference, San Juan, PR, June, 1992
- Session Chair: SPACE 92, ASCE Specialty Conference, Denver, CO May, 1992

POLICY

- Appointed to taskforce on under-representation of Hispanics in the Federal Workforce, US Office of Personnel Management Director, the Honorable Kay Cole James, 2001-present.
- Invited Participant in White House Conference on Environmental Technologies; Dec. 1994
- Invited Participant, Civil Engineering Research Foundation Workshop "Geo-engineering for the 21st Century," Civil Engineering Research Foundation, Washington, D.C. May 1994
- Invited Contributor to President Clinton's Science Policy Document; ***Science in the National Interest***; White House Office of Science & Technology Policy; 1/94; "Internationalization of Research in Science and Technology: Stressing Hemispherical Partnerships"

EDUCATION

- Mentoring program organizer for the Atlanta Washington Evening School, 1998.
- Organizer of Tech-Tutors; Mentoring of Latino Elementary School Children by Students from the Society of Hispanic Professional Engineers Georgia Tech student chapter, 1998-2000.
- Invited Panelist/Reviewer, National Research Council, Ford Foundation 1995-1996
- Invited Participant in NSF Conference on Reform of Math and Science Education; co-chaired a session on Urban Education Systemic Reform; February 1994
- Participated in the proposal and implementation of the Ph.D. program in the Department of Civil Engineering at the University of Puerto Rico at Mayagüez, 1992
- NSF Site Reviewer for the Synthesis Engineering Educational Coalition. Visited Cornell University, Hampton University, Tuskegee University, Southern University, University of California at Berkeley, Stanford University and Iowa State University, April-June, 1992.

PROFESSIONAL SOCIETIES AND ORGANIZATIONS

POLICY/SCIENCE

- Society for the Advancement of Chicanos and Native Americans in Science (SACNAS); Board of Directors and Life Member
- American Association for the Advancement of Science (AAAS), Member
- Sigma Xi (The Scientific Research Society), Life Member (International Committee Member; Strategic Planning Committee Member)
- New York Academy of Sciences, Member

ENGINEERING

- American Society of Civil Engineers (ASCE), Member
- International Society of Soil Mechanics and Foundation Engineering (ISSMFE), Member
- Mexican-American Engineering Society (MAES), Member
- Society of Hispanic Professional Engineers (SHPE), Board Member
- Chi Epsilon (Civil Engineering Honor Society), Member
- American Society for Testing and Materials (ASTM), Member
- Tau Beta Pi, The Engineering Honor Society

EDUCATION

- American Society of Engineering Education (ASEE), Member

VI. GRANTS AND CONTRACTS
PRINCIPAL OR CO-PRINCIPAL INVESTIGATOR

- California Energy Commission, “California Smart Grid Center” $2,000,000 7/2010-7/2013 PI
- U.S. Department of Energy, “Smart Grid Workforce Development”, $905,000 2010-13 PI
- California Energy Commission, “Smart Grid Center” 5 proposals totaling $900,000, 2008-09
- National Science Foundation, “NSF Scholar's Program in Engineering and Computer Science,” $500,000, 11/06 – 11/08 PI
- U.S. Army Corps of Engineers, "Progressive Analysis Framework for Seismic Design of Concrete Hydraulic Structures," $132,500, 3/03-03/04, Co-PI with Enrique Matheu.
- National Science Foundation, IPA, Centers of Research Excellence in Science and Technology, $225,000, 2001-02, PI.
- National Science Foundation, "Hurricane Engineering: A New Curriculum for a Planet at Risk", $500,000, 7/00 - 6/02, Co-PI with Marc Levitan.
- U.S. Army Corps of Engineers, "Analysis and Evaluation of the Nonlinear Response of Concrete Gravity Dams under Seismic Excitations," $320,000, 02/00-03/03, Co-PI with Enrique Matheu.
- Packard Foundation, "Science Networking in Developing Countries" $568,000 with Sigma Xi, 12/99 - 12/01, Co-PI with Peter Blair and Thomas Malone.
- LA Board of Regents, "Hurricane Engineering Research - A Multidisciplinary Approach", $35,000, 3/00 - 3/01, PI
- NSF/MAEC, “Dynamic Properties of Mid-America Soils,” $111,000, 1998-2000, Co-PI
- USGS, “Earthquake Hazard Assessment of Western Puerto Rico,” $25,000, 1997, PI
- NSF/US State Dept./Sandia National Laboratories, Support for Workshop titled “Environmental Quality, Innovative Technologies, and Sustainable Economic Development - A NAFTA Perspective,” $77,000, 1995-96, PI
- USGS, “Earthquake Hazard Assessment of Western Puerto Rico,” $85,000, 1994-1995, PI
- NSF/PRIDCO, Support for Workshop titled “Geo-Environmental Issues Facing the Americas,” $47,000, 1994, Co-PI
- NSF/White House Presidential Faculty Fellow, $500,000 1993–1998, PI
- NSF, “Computational Facility in Support of Civil Infrastructure Research,” $98,500, University of Puerto Rico at Mayagüez (UPRM), 1993, Co-PI
- NSF/EPSCOR, “Civil Infrastructure Research Center,” $300,000, UPRM, 1993, Co-PI
- PR Earthquake Safety Commission, “Liquefaction Assessment of Western Puerto Rico,” $10,000, UPRM, 1992, PI
- NASA/JOVE, “Mechanics of Granular Materials under Low Confining Stresses under Reduced Gravity Environments and Design of Lunar Bases,” $87,000, UPRM, 1991, PI
- NSF Research Equipment Grant, “Resonant Column Device,” $23,000, UPRM, 1990, PI
- NSF Research Planning Grant, “Study of Soil Anisotropy - Resonant Column Testing,” $12,000, UPRM, 1990, PI

VII. HONORS AND AWARDS

Research and Education

- ***California Council on Science and Technology***, Senior Fellow, 2012
- ***California Seismic Safety Commission***, Commissioner, Appointed by Governor Schwarzenegger, 2010. Appointed by Governor Brown, 2011 to a 4-year term.
- ***Academy of Distinguished Alumni***, Virginia Tech, Charles Via School of Civil and Environmental Engineering, 2008
- ***Highest Academic Achievements & Contributions to LSU***, Louisiana Legislature 2004
- ***Aldo Leopold Leadership Fellow***, 2001
- ***Bingham C. Stewart Distinguished Professor of Engineering***, 1999 - 2001
- ***Presidential Faculty Fellow White House/NSF***, 1992-1998, "In recognition of your demonstrated excellence and continued promise both in scientific and engineering research and in teaching future generations of students to extend & apply human knowledge"
- ***Georgia Tech Engineering,*** Best Journal Paper Award, 1998
- ***Distinguished Professor of Civil Engineering***, In recognition of his excellent academic performance as an Associate Professor and Researcher," University of Puerto Rico, 1990-93
- ***EPSCoR Scholarly Productivity Award***, "In Recognition of his Contribution to the Development of Scientific Research in Puerto Rico," University of Puerto Rico, 1992
- ***NASA/ASEE Research Fellow***, Marshall Space Flight Center, Alabama (1990 -1991)
- ***NASA Educational PhD Dissertation Fellowship***; (1987-1989)

Student Advising

- ***Certificate of Appreciation***, "For his dedication, encouragement and support of our organization. We are lucky to have him as our faculty advisor," Georgia Institute of Technology Student Chapter of the *Society of Hispanic Professional Engineers*, 1996
- ***Plaque of Recognition***, "In recognition of the great help he provided as professional advisor and as a friend," UPRM *American Society of Civil Engineers*, 1993
- ***Plaque of Recognition***, "For his work, not only as advisor but also as educator and friend," UPRM Student Chapter of the *American Society of Civil Engineers*, 1991

International Cooperation

- ***Member of the Mexican Academy of Science***, Mexico City, Mexico 2005
- ***Member of the Academy of Engineering of Mexico***, Mexico City, Mexico, 2003
- ***International Engineering Education Leadership Award***, Oslo, Norway, 2001
- ***Illustrious Visitor*** Certificate Department of Chemistry and Chemical Engineering, National University of the South, Bahia Blanca, Argentina, 1997
- ***Distinguished Visitor*** Certificate by the Mayor of Boca del Rio, Mexico, 1996
- ***Distinguished Visitor*** Certificate by the Mayor of the City of Veracruz, Mexico, 1992

TEACHING

NEW COURSES DEVELOPED AND CONTINUING EDUCATION

New Courses Developed

- ***CE 4700*** **Design and construction of Offshore Structures**
  This course was designed as a capstone course in which the students would use their knowledge of geotechnical, structural and construction engineering to design and plan the construction of offshore structures. Special attention was given to steel pile jacket-type platforms. Students had to prepare a proposal, prepare marketing strategies to compete for a job, prepare a presentation on the technical expertise of their company and then design a structure to given specifications.

- ***CE 6178*** **Landfills and Embankments**
  This course was designed to present students the fundamentals of design, construction, and monitoring of landfills and embankments. Special attention is given to the design and construction of water retaining structures such as dams, levees, impermeable blankets for containment of hazardous materials and landfills. This course is one that provides a direct link between the geosystems program and the environmental program and is core course in our geoenvironmental engineering option.

- ***CE 6160*** **Constitutive Modeling of Soils**
  This course was developed as a follow up to the introductory course "Engineering Properties of Soils" and it represents the first part of a two-course sequence. The concepts of shear strength are expanded in the context of Critical State Soil Mechanics (CSSM). From the perspective of CSSM, a simple and educational elasto-plastic constitutive model (Cam-Clay Model) is developed for the prediction of the mechanical response of cohesive soils. The students are expected to develop their own computational codes.

- ***CE 6170*** **Computational Soil Elasto-Plasticity**
  This course is the second of the series of courses on numerical modeling of soil behavior. The course provides the tools for the development of sophisticated Finite Element Based elasto-plastic formulations. Students are expected to develop their own comprehensive computational codes for the prediction of the response of boundary value problems related to soil structures. Various integration schemes are discussed and emphasis is placed on fully implicit techniques, in particular the Backward-Euler "Closest-Point-Projection-Algorithm." The course discusses advantages and disadvantages of many of the currently available elasto-plastic constitutive models for soils. Students from other engineering disciplines have been registering for this two-course sequence, including students from the Structural and Engineering Mechanic program, Mechanical Engineering and Aerospace Engineering.

Course No.	Course Title	Semester/Quarter	Size	1	2	3	4
CE 7305	Numerical Methods in Geotechnical Engineering	Fall 03	5				
CE 3350 (LSU)	Geotechnical Laboratory (2 sections)	Fall 03	25				
CE 7300 (LSU)	Advanced Geotechnical Engineering I	Spring 02	13				
CE 3300 (LSU)	Introduction to Geotechnical Engineering	Spring 02	29				
CE 7350 (LSU)	Soil Dynamics and Earthquake Engineering	Summer 01	6	N/A			
CE 7310 (LSU)	Advanced Geotechnical Engineering II	Spring 01	6	N/A			
CE 7300 (LSU)	Advanced Geotechnical Engineering I	Fall 00	6	N/A			
CE 7315 (LSU)	Fundamentals of Soil Behavior	Fall 99	6	N/A			
CE 6152	Advanced Soils Laboratory II	Winter 99	14	N/A			
CE 6160	Constitutive Modeling of Soils	Winter 99	8	N/A			
CE 6151	Advanced Soils Laboratory I	Fall 98	12	N/A			
CE 4164	Introduction to Geotechnical Engineering	Fall 98	45	N/A			
CE 4700	Design and Construction of Offshore Structures	Summer 98	17	N/A			
CE 4173	Foundation Engineering	Winter 98	45	4.1	4.0	4.2	3.9
CE 6160	Constitutive Modeling of Soils	Winter 98	6	N/A			
CE 6150	Engineering Properties of Soils	Fall 97	16	4.3	4.1	4.6	3.7
CE 4164	Introduction to Geotechnical Engineering	Spring 97	58	4.3	4.1	4.4	4.2
CE 6160	Constitutive Modeling of Soils	Spring 97	10	4.4	4.2	4.6	4.3
CE 4173	Foundation Engineering	Fall 96	45	4.3	4.2	4.2	4.1
CE 4164	Introduction to Geotechnical Engineering	Summer 96	22	4.7	4.2	4.3	4.0
CE 4173	Foundation Engineering	Spring 96	32	4.2	4.1	4.4	4.0
CE 6160	Constitutive Modeling of Soils	Winter 96	7	N/A1			
CE 4164	Introduction to Geotechnical Engineering	Fall 95	51	3.7	3.7	3.9	3.5
CE 6178*	Landfills & Embankments	Fall 95	14	4.0	3.2	4.2	3.0
CE 8103*	Remediation Technologies for Hazardous Waste Sites	Summer 95	35	N/A2			
CE 6170*	Computational Soil Elasto-Plasticity	Spring 95	9	4.8	4.4	4.3	4.1
CE 4173	Foundation Engineering	Spring 95	48	3.7	3.7	4.0	3.2
CE 6160*	Constitutive Modeling of Soils	Winter 95	10	4.3	4.2	4.3	4.0
CE 8113	Landfills & Embankments	Fall 94	6	N/A2			
CE 6163	Engineering Properties of Soils	Fall 94	20	4.3	4.1	4.6	4.1
CE 4164	Introduction to Geotechnical Engineering	Spring 94	35	4.4	4.2	4.3	4.2
CE 4163	Soil and Rock Engineering	Winter 94	48	3.8	3.7	3.9	3.6
CE 8113C	Design and Construction of Slopes & Embankments	Fall 93	11	4.0	3.9	4.6	3.9

University of Puerto Rico at Mayagüez (reviews required for undergraduate classes and graduate classes of 10 or larger)

INCI 6078	Soil Dynamics	Winter 93	5				
INCI 6038+	Advanced Foundation Engineering	Fall 92	7				
INCI 6041	Advanced Soil Mechanics Laboratory	Fall 92	7				
INCI 6078	Advanced Soil Mech. II Shear Strength	Winter 92	10	4.5			
INCI 6078	Soil Dynamics	Winter 92	9				
INCI 6031*	Advanced Soil Mech. I; Consolidation	Fall 91	5	4.6			
INCI 6035+	Advanced Soil Mechanics Laboratory	Fall 91	6				
INCI 4139	Introduction to Geotechnical Engineering	Winter 91	45	4.1			
INCI 6078+	Advanced Soil Mech. II Shear Strength	Winter 91	7				
INCI 6078*	Soil Dynamics	Fall 90	7				
INCI 6995*	Elasto-Plasticity of Soils	Fall 90	5				
INCI 6078	Advanced Soil Mech. II; Shear Strength	Winter 90	3				
INCI 4139	Introduction to Geotechnical Engineering	Winter 90	38	4.3			

1 Teaching Effectiveness - Georgia Tech Question # 24;
2 Core Item - Preparation and Presentation of Course;
3 Core Item - Interaction with Students;
4 Core Item - Assessment of Student Performance;

N/A1 Indicates: Did not receive the feedback from Survey
N/A2 Indicates: Opinion Survey was not performed

FIVE SIGNIFICANT INTELLECTUAL PRODUCTS

- **Macari-Pasqualino, Emir Jose, "Behavior of Granular Materials in a Reduced Gravity Environment and Under Low Effective Stresses," Ph.D. Dissertation, University of Colorado at Boulder, 177p., August, 1989.**

  This dissertation was funded under a NASA Educational Training Grant - Ph.D. Dissertation Fellowship (1987-1989). The dissertation involved the numerical prediction of the mechanical response of granular materials for the design and construction of lunar bases as well as the prediction of the planned Space Shuttle experiment titled "Mechanics of Granular Materials (MGM) Experiment." The true significance of this work is attested by the successful performance of three experiments on granular soils aboard the Space Shuttle Orbiter STS-79 on September 1996 and six more aboard STS-89 on February 1998. The author's specific involvement in this experiment was to assist in the preliminary design of the experimental apparatus, performance of a comprehensive series of ground-based experiments, development of a methodology for the assessment of the homogeneity and isotropy of the soils specimens by means of digital imaging techniques. as well as performance of numerical predictions of the behavior of the soil specimens during launch (high dynamic gravitational excitation) and during the testing in microgravity. The research work continued in Puerto Rico under a NASA/JOVE grant as well as the "MGM" NASA grant at the University of Colorado at Boulder. ***NASA Press Release*** "For decades, researchers seeking to unravel the behavior of these materials have been hampered by Earth's gravity. Today, however, astronauts aboard the Space Shuttle Atlantis are taking advantage of the micro-gravity environment of space to study what actually happens to granular materials under low stress. Working with scientists on Earth at NASA's Marshall Space Flight Center, Huntsville, AL, astronauts on Atlantis examined materials in simulated conditions that typically are present when granular systems deform or collapse. To understand how such granular materials behave under low stresses, the Atlantis crew and researchers back on Earth studied three dry soil specimens under different pressures. The saturated specimens will be loaded, either by compressing them and then unloading them, or by subjecting them to 'cyclic loading,' a condition encountered in earthquakes. This research may be applied to a variety of other fields, including earthquake engineering, landslides, mining, soil erosion and the irreversible loss of enormous amounts of windblown, fertile soil."

- **Macari, E.J. and Hoyos, L.R., "Effects of Weathering on the Dynamic Properties of Residual Soils," *American Society of Civil Engineers, Journal of Geotechnical Engineering Division*, Vol. 122, No.12, pp. 988-997, December, 1996.**

  This product is the result of a research project funded by the UPRM Civil Infrastructure Research Center during the summer and fall of 1993. The significance of this product is that it fills a gap in the understanding of the response of residual soil deposits subjected to seismic excitation. Many soil deposits within tropical and sub-tropical regions around the world, including most of the Caribbean, Central and South America as well as the Southeastern United States, are the result of rock decomposition due to weathering processes. In addition, many of these regions are also susceptible to potential moderate to high seismicity. The results of this research has been requested by a large number of researchers around the world including Colombia, Puerto Rico, Mexico, and recently from the Slovak Republic, even before formal publication of the journal article. Georgia Tech, through the work of the late Professor George Sowers and Emeritus Professor Richard Barksdale, is known as a leading institution in the study of residual soils. However, it is only now that we are able to understand the relationship between weathering behavior of the mother rock and the dynamic response of residual soils. Preliminary results of this study were presented at the Pan American Conference of Soil Mechanics and Foundation Engineering, Nov. 1995.

- **Macari, E.J. and Ko, H.-Y., "Anisotropic Characteristics of an Overconsolidated Silt by Resonant Column Testing," *American Society for Testing and Materials, Geotechnical Testing Journal*, September, 1994, Vol. 17, No. 3, pp. 315-324.**

  This product is the result of two research projects, the first was initially undertaken as part of the author's Master's thesis and subsequently continued under a 1990 NSF Research Initiation Planning grant at UPRM. This grant permitted the author to purchase a Resonant Column device and perform a series of experimental tests on anisotropically consolidated silty materials. The significance of this work is that this was the first attempt to link laboratory induced torsional dynamic loading to insitu geophysical testing. Most soils in nature exhibit varying degrees of anisotropy. However, most laboratory testing assumes that soils are isotropic for the analysis of the results. In addition, during geophysical testing seismic waves often travel perpendicularly to the angle of deposition, hence, traveling at varying velocities. Analysis of these tests often assumes that soils are isotropic and have ignored the influence that anisotropically deposited processes may have on the response. This project provides conclusive evidence that there are significant deviations as a result of anisotropy and provides empirical relations that may be used to minimize potential analytical errors.

- **Macari, E.J., Weihe, S., and Arduino, P., "Implicit Integration of Elasto-Plastic Constitutive Models with Highly Nonlinear Hardening Functions," *International Journal of Mechanics of Cohesive-Frictional Materials*, John Wiley and Sons, in press, Vol. 2, March, 1997, pp. 1-29.**

  This product is the result of two separate research projects, one that began as a parallel item to the author's Ph.D. dissertation in order to solve a numerical instability and the second as a continuation project at UPRM and in cooperation with colleagues at Stuttgart University, Germany. The significance of this product is that it incorporates some innovative numerical algorithms for the solution of inaccuracies and instabilities in the numerical integration of highly non-linear hardening functions as part of an elasto-plastic analysis. Highly non-linear hardening formulations are very commonly encountered for the simulation of granular materials that exhibit high densities and are subjected to low confinement stresses. These situations are often encountered in surficial soil deposits as well as in road sub-bases. This work was also presented in an invited keynote presentation in Rio de Janeiro, Brazil.

- **Arduino, P., Op den Bosch, A. and Macari, E.J., "Geotechnical Triaxial Soil Testing in a Virtual Environment," *Journal of Computing in Civil Engineering, American Society of Civil Engineers*, Vol. 11, No. 1, January, 1997, pp. 44-47.**

  This work involved the Development of a Virtual Reality Geotechnical Laboratory for Education and Training of Engineering Students and Laboratory Technicians. The main product is a software package that was developed as an experimental prototype tool to explore ways to use virtual reality for training personnel in the use of specialized geotechnical engineering laboratory equipment such as the cyclic triaxial device and the direct simple shear device. The software package has already undergone various modifications since it was initially featured in Georgia Tech Research Horizons, Summer/Fall 1995 issue. The significance of this product is that it represents an innovative approach to engineering education in the use of sophisticated laboratory equipment. In recent years, the wide discipline of Civil Engineering has undergone some major curricular restructuring in order to maintain the number of credit requirements to a acceptable number. These time restrictions must maintain a rigorous education in laboratory techniques and material behavior. However, the learning of geotechnical testing procedures often involve obstacles which lead to inefficient use of time as specimens fail prematurely due to a variety of mistakes that students often commit. This software package will allow students to explore a variety of what-if scenarios without the time consumption. This approach is not meant to replace the hands-on experience but to enhance and optimize the learning process.