

JAMES R. FUNK, PHD

CURRICULUM VITAE

EDUCATION

Ph.D.	Biomedical Engineering, University of Virginia Charlottesville, Virginia	2000
M.S.E.	Biomedical Engineering, University of Virginia Charlottesville, Virginia	1997
B.S.E.	Biomedical Engineering, Duke University Durham, North Carolina	1995

CONTINUING EDUCATION

Biomechanics of Injury Association for the Advancement of Automotive Medicine Melbourne, Victoria, Australia	2007
Biomechanics of High-Impact Injury Association for the Advancement of Automotive Medicine and National Transportation Safety Board, Ashburn, Virginia	2007
Injury Biomechanics: Advanced Technologies and New Frontiers 5 th Annual Center for Injury Biomechanics Instructional Symposium Virginia Polytechnic and State University, Blacksburg, Virginia	2007
Automobile Safety and Injury Biomechanics 4 th Annual Center for Injury Biomechanics Instructional Symposium Virginia Polytechnic and State University, Blacksburg, Virginia	2005
Occupant and Vehicle Kinematics in Rollovers Seminar Society of Automotive Engineers, Troy, Michigan	2004
The Basics of Crash Injury and Biomechanics Association for the Advancement of Automotive Medicine New Orleans, Louisiana	2003

Biomechanics of Impact Association for the Advancement of Automotive Medicine Tempe, Arizona	2002
Traffic Accident Reconstruction I & II	2003
Traffic Accident Investigation I Northwestern University Traffic Institute, Evanston, Illinois	2002

PROFESSIONAL EXPERIENCE

Consultant Technical Director Biodynamic Research Corporation San Antonio, Texas	2006 – Present 2002 – 2006
Research Scientist Automobile Safety Laboratory, University of Virginia Charlottesville, Virginia	2000 – 2002
Graduate Research Assistant Automobile Safety Laboratory, University of Virginia Charlottesville, Virginia	1997 – 2000
Graduate Research Assistant Orthopaedic Biomechanics Laboratory, University of Virginia Charlottesville, Virginia	1995 – 1997
National Science Foundation/Engineering Research Center, Undergraduate Fellow Duke University Durham, North Carolina	1994 – 1995

PROFESSIONAL ACTIVITIES

Scientific Program Committee Member Association for the Advancement of Automotive Medicine	2008 – Present
Course Organizer, Biomechanics of Injury Association for the Advancement of Automotive Medicine	2007

Accredited Traffic Accident Reconstructionist (#1705) 2006 – Present
Accreditation Commission for Traffic Accident Reconstruction

Affiliate Member, ASTM International 2005 – Present
Committee F24 on Amusement Rides and Devices

Adjunct Assistant Professor, Mechanical Engineering 2004 – Present
Virginia Tech – Wake Forest Center for Injury Biomechanics
Virginia Polytechnic and State University
Blacksburg, Virginia

Reviewer

Clinical Adjunct Professor, USAF School
Of Aerospace Medicine 2008 – Present
American Journal of Sports Medicine 2005 – Present
Society of Automotive Engineers 2003, 2007
Journal of Biomechanics 2002 – Present
Association for the Advancement of Automotive Medicine 2002, 2008

PROFESSIONAL SOCIETIES

Association for the Advancement of Automotive Medicine 2002 – Present
Society of Automotive Engineers 2000 – Present
American Indian Science and Engineering Society 1999 – Present

HONORS AND AWARDS

SAE Excellence in Oral Presentation Award 2007
Biomedical Engineering Merit Award 2000
Dean's Fellowship 1995 – 1998
Leonardo Da Vinci Award 1995
Summa Cum Laude 1995
Phi Beta Kappa 1993
Tau Beta Pi 1993
Golden Key National Honor Society 1992
Phi Eta Sigma Freshman Honor Society 1992
Delta Phi Alpha German Honor Society 1992
Dean's List with Distinction 1991 – 1995
Presidential Scholar 1991
National Merit Finalist 1991
Eagle Scout 1989

PEER-REVIEWED JOURNAL PUBLICATIONS

Untaroiu, C., Kerrigan, J., Kam, C., Crandall, J., Yamazaki, K., Fukuyama, K., Kamiji, K., Yasuki, T., Funk, J., "Correlation of Strain and Loads Measured in the Long Bones with Observed Kinematics of the Lower Limb during Vehicle-Pedestrian Impacts," Paper 2007-22-0018, *Stapp Car Crash Journal*, vol. 51, 2007.

Funk, J.R., Rudd, R.W., Kerrigan, J.R., Crandall, J.R., "The Line of Action in the Tibia during Axial Compression of the Leg," *Journal of Biomechanics*, 40: 2277 – 2282, 2007.

Funk, J.R., Rudd, R.W., Kerrigan, J.R., Crandall, J.R., "The Effect of Tibial Curvature and Fibular Loading on the Tibia Index," *Traffic Injury Prevention*, 5(2): 164 – 172, 2004.

Funk, J.R., Srinivasan, S.C.M., Crandall, J.R., "Snowboarder's Talus Fractures Experimentally Produced by Eversion and Dorsiflexion," *American Journal of Sports Medicine*, 31(6): 921 – 928, 2003.

Kent, R., Funk, J., Crandall, J., "How Future Trends in Societal Aging, Airbag Availability, Belt Use, and Fleet Composition Will Affect Serious Injury Risk in the U.S.," *Traffic Injury Prevention*, 4(1): 1 – 9, 2003.

Funk, J.R., Rudd, R.W., Srinivasan, S.C.M., King, R.J., Crandall, J.R., Petit, P., "Methodology for Measuring Tibial and Fibular Loads in a Cadaver," *SAE Transactions – Journal of Passenger Cars: Mechanical Systems*, paper 2002-01-0682, pp. 960 – 969, 2002.

Funk, J.R., Srinivasan, S.C.M., Crandall, J.R., Khaewpong, N., Eppinger, R., Jaffredo, A.S., Potier, P., Petit, P., "The Effects of Axial Preload and Dorsiflexion on the Tolerance of the Ankle/Subtalar Joint to Dynamic Inversion and Eversion," *Stapp Car Crash Journal*, paper 2002-22-0013, 46: 245 – 265, 2002.

Funk, J.R., Crandall, J.R., Tournet, L.J., MacMahon, C.B., Bass, C.R., Patrie, J.T., Khaewpong, N., Eppinger, R.H., "The Axial Injury Tolerance of the Human Foot/Ankle Complex and the Effect of Achilles Tension," *ASME Journal of Biomechanical Engineering*, 124(6): 1 – 8, 2002.

Funk, J.R., Tournet, L.J., George, S.E., Crandall, J.R., "The Role of Axial Loading in Malleolar Fractures," *SAE Transactions – Journal of Passenger Cars: Mechanical Systems*, paper 2000-01-0155, 109(6): 212 – 223, 2000.

Funk, J.R., Hall, G.W., Crandall, J.R., and Pilkey, W.D., "Linear and Quasi-Linear Viscoelastic Characterization of Ankle Ligaments," *ASME Journal of Biomechanical Engineering*, 122(1): 15 – 22, 2000.

Funk, J.R., Hale, J.E., Carmines, D., Gooch, H.L., Hurwitz, S.R., "Biomechanical Evaluation of Early Fracture Healing in Normal and Diabetic Rats," *Journal of Orthopaedic Research*, 18(1): 126 – 132, 2000.

PEER-REVIEWED CONFERENCE PUBLICATIONS

Funk, J.R., Cormier, J.M., Bain, C.E., Guzman, H., Bonugli, E., "Relationship Between Linear and Rotational Head Acceleration in Various Activities," accepted for the *Proceedings of the 45th Annual Rocky Mountain Bioengineering Symposium*, 2008.

Funk, J.R., Beauchamp, G., Rose, N.A., Fenton, S.J., Pierce, J., "Occupant Ejection Trajectories in Rollover Crashes: Full-Scale Testing and Real World Cases," SAE 2008-01-0166, accepted for the *2008 Society of Automotive Engineers (SAE) World Congress*, 2008.

Funk, J.R., Duma, S.M., Manoogian, S.J., Rowson, S., "Biomechanical Risk Estimates for Mild Traumatic Brain Injury," *Annual Proceedings of the Association for the Advancement of Automotive Medicine (AAAM)*, pp. 343 – 361, 2007.

Funk, J.R., Cormier, J.M., Bain, C.E., Guzman, H., Bonugli, E., "An Evaluation of Various Neck Injury Criteria in Vigorous Activities," *Proceedings of the International Research Conference on the Biomechanics of Impact (IRCOBI)*, pp. 233 – 248, 2007.

Funk, J.R. and Luepke, P.A., "Trajectory Model of Occupants Ejected in Rollover Crashes," SAE 2007-01-0742, *2007 Society of Automotive Engineers (SAE) World Congress*, 2007.

Funk, J.R. and Duma, S.M., "Biomechanical Risk Estimates for Concussion in Collegiate Football Players," *Proceedings of the 30th Annual Meeting of the American Society of Biomechanics (ASB)*, 2006.

Funk, J.R. and Crandall, J.R., "Calculation of Tibial Loading Using Strain Gauges," *Proceedings of the 43rd Annual Rocky Mountain Bioengineering Symposium*, in *Biomedical Sciences Instrumentation*, 42: 160 – 165, 2006.

Funk, J.R., Kerrigan, J.R., Crandall, J.R., “Dynamic Bending Tolerance of the Human Femur,” *Annual Proceedings of the Association for the Advancement of Automotive Medicine (AAAM)*, 48: 215 – 233, 2004.

Madeley, N.J., Srinivasan, C.M.S., Crandall, J.R., Hurwitz, S., Funk, J.R., “Retrospective Analysis of Malleolar Fractures in an Impact Environment,” *Annual Proceedings of the Association for the Advancement of Automotive Medicine (AAAM)*, 48: 235 – 248, 2004.

Funk, J.R., Cormier, J.M., Bain, C.E., “Analytical Model for Investigating Low-Speed Sideswipe Collisions,” SAE 2004-01-1185, *2004 Society of Automotive Engineers (SAE) World Congress*, 2004.

Lessley, D., Crandall, J.R., Shaw, C.G., Kent, R.W., Funk, J.R., “A Normalization Technique for Developing Corridors for Individual Subject Force-Deflection Responses,” SAE 2004-01-0288, *2004 Society of Automotive Engineers (SAE) World Congress*, 2004.

Kent, R.W. and Funk, J.R., “Data Censoring and Parametric Distribution Assignment in the Development of Injury Risk Functions from Biomechanical Data,” SAE 2004-01-0317, *2004 Society of Automotive Engineers (SAE) Congress*, 2004.

Funk, J.R., Rudd, R.W., Kerrigan, J.R., Crandall, J.R., “Analysis of Tibial Curvature, Fibular Loading, and the Tibia Index,” *Proceedings of the International Research Conference on the Biomechanics of Impact (IRCOBI)*, pp. 135-147, 2003.

McConnell, W.E., Guzman, H.M., Krenrich, S.W., Bomar, J.B., Jr., Harding, R.M., Raddin, J.H., Jr., Funk, J.R., Smith, D.A., “Human Kinematics During Non-Collinear Low Velocity Rear End Collisions,” *Annual Proceedings of the Association for the Advancement of Automotive Medicine (AAAM)*, 47: 467 – 492, 2003.

Kerrigan, J.R., Bhalla, K.S., Madeley, N.J., Funk, J.R., Bose, D., Crandall, J.R., “Experiments for Establishing Pedestrian-Impact Lower Limb Injury Criteria,” SAE 2003-01-0895, *2003 Society of Automotive Engineers (SAE) World Congress*, 2003.

Kent, R., Funk, J., Crandall, J., “U.S. Injury Trends Projected to 2012: The Influence of an Aging Population,” *Proceedings of the 46th Annual Conference for the Association for the Advancement of Automotive Medicine (AAAM)*, pp. 157-178, 2002.

Paskoff, G., Lakner, M., Funk, J., Kerrigan, J., Crandall, J., "Effect of Thigh Gap on Femur Impact during Ejection of Large Aviators," *Proceedings of the 40th Annual Safety and Flight Equipment (SAFE) Conference*, 2002.

Srinivasan, S.C.M., Funk, J.R., Huang, C., Crandall, J.R., "Lateral Process of Talus (Snowboarder's) Fracture - Mechanism of Injury," *European Society of Sports traumatology, Knee surgery, and Arthroscopy (ESSKA) Conference*, 2002.

Funk, J.R., Rudd, R.W., Srinivasan, S.C.M., King, R.J., Crandall, J.R., Petit, P., "Methodology for Measuring Tibial and Fibular Loads in a Cadaver," SAE 2002-01-0682, *2002 Society of Automotive Engineers (SAE) World Congress*, 2002.

Funk, J.R., Crandall, J.R., Turret, L.J., MacMahon, C.B., Bass, C.R., Khaewpong, N., Eppinger, R.H., "The Effect of Active Muscle Tension on the Axial Injury Tolerance of the Human Foot/Ankle Complex," Paper 237, *Proceedings of the 17th International Technical Conference on the Enhanced Safety of Vehicles (ESV)*, 2001.

Funk, J.R., Turret, L.J., Crandall, J.R., "Experimentally Produced Tibial Plateau Fractures," *Proceedings of the International Research Conference on the Biomechanics of Impact (IRCOBI)*, pp. 171-182, 2000.

Funk, J.R., Turret, L.J., Crandall, J.R., "Estimation of Fibula Load-Sharing During Dynamic Axial Loading of the Lower Extremity," *Proceedings of the 24th Annual Meeting of the American Society of Biomechanics (ASB)*, pp. 239-240, 2000.

Funk, J.R., Turret, L.J., George, S.E., Crandall, J.R., "The Role of Axial Loading in Malleolar Fractures," SAE 2000-01-0155, *2000 Society of Automotive Engineers (SAE) World Congress*, 2000.

Crandall, J.R., Funk, J.R., Rudd, R.W., Turret, L. J., "The Tibia Index: A Step in the Right Direction," *Proceedings of the Toyota International Symposium on Human Life Support Biomechanics*, 1999.

Funk, J.R., Hall, G.W., Crandall, J.R., and Pilkey, W.D., "Quasi-Linear Viscoelasticity of Ankle Ligaments," *Proceedings of the 23rd Annual Meeting of the American Society of Biomechanics (ASB)*, pp. 174-175, 1999.

Duma, S.M., Crandall, J.R., Rudd, R.W., Funk, J.R., and Pilkey, W.D., "Small Female Head and Neck Interaction With a Deploying Side Air Bag," *Proceedings of the International Research Conference on the Biomechanics of Impact (IRCOBI)*, pp. 191-200, 1999.

Funk, J.R., Hale, J.E., Carmines, D., Gooch, H.L., Hurwitz, S.R., "Biomechanical Evaluation of Fracture Healing in Normal and Diabetic Rats," *Proceedings of the 21st Annual Meeting of the American Society of Biomechanics (ASB)*, pp. 103-104, 1997.

Gooch, H.L., Hurwitz, S.R., Funk, J., Hale, J.E., Carmines, D., Thakur, R.K., Anderson, P., Balian, G., "Alteration of cartilage expression in fracture healing in experimental diabetes," *Transactions of the Orthopaedic Research Society (ORS)*, 43: 605, 1997.

OTHER PUBLICATIONS

Funk, J.R., Duma, S.M., Manoogian, S.J., Rowson, S., "Development of Concussion Risk Curves Based on Head Impact Data from Collegiate Football Players," *Proceedings of the 34th International Workshop on Human Subjects for Biomechanical Research*, 2006.

Funk, J.R., Crandall, J.R., "Estimation of Long Bone Bending Using Strain Gauges," *Proceedings of the 32nd International Workshop on Human Subjects for Biomechanical Research*, 2004.

Lessley, D., Crandall, J., Kent, R., Shaw, G., Funk, J., "A Normalization Technique for Developing Corridors for Individual Subject Force-Deflection Responses," *Proceedings of the 31st International Workshop on Human Subjects for Biomechanical Research*, 2003.

Funk, J. and Raddin, J., "Aerospace Medicine in a Non-traditional Setting: The Physiology and Safety of Amusement Rides: A Review of the Physics," *74th Annual Meeting of the Aerospace Medical Association (AsMA)*, May, 2003.

Funk, J.R., Kerrigan, J., Madeley, N.J., Crandall, J.R., "Posterior-Anterior Bending Tolerance of the Femur in Large Males," Final Report, Naval Air System Contract N00421-00-D-0675, May, 2002.

Funk, J.R., King, R., Srinivasan, S.C.M., Huang, C., Crandall, J.R., "The Effect of Axial Load and Dorsiflexion on the Dynamic Inversion/Eversion Tolerance of the Ankle/Subtalar Joint," Final Report to the National Highway Traffic Safety Administration (NHTSA), Contract No. DTNH22-01-H-07292, May, 2002.

Funk, J.R., Crandall, J.R., Tourret, L.J., MacMahon, C.B., Bass, C.R., Patrie, J., "Development of an Injury Criterion for Axial Loading of the Foot/Ankle Complex," Final Report to the National Highway Traffic Safety Administration (NHTSA), Contract No. DTNH22-93-07028, October, 2001.

Funk, J.R., Martin, P.G., Crandall, J.R., "A Method for Approximating High Rate Viscoelastic Properties of Soft Tissues from Low Rate Tests," poster presentation at the *2001 Annual Fall Meeting of the Biomedical Engineering Society (BMES)*, 2001.

Srinivasan, S.C.M., Funk, J.R., Sherwood, C.P., Crandall, J.R., "Retrospective Assessment of Malleolar Fracture Mechanism in an Impact Environment," poster presentation at the *45th Annual Meeting of the Association for the Advancement of Automotive Medicine (AAAM)* (cancelled), pp. 405-407, 2001.

Funk, J.R., Rudd, R.W., King, R.J., Srinivasan, S.C.M., Crandall, J.R., "Talar Neck Fractures and Other Injuries Caused by Brake Pedal Loading of the Midfoot and Forefoot," Final Report to the National Highway Traffic Safety Administration (NHTSA), Contract No. DTNH22-96-H-07283, August, 2001.

Funk, J.R., Bass, C.R., Rudd, R., Crandall, J.R., Tourret, L., MacMahon, C., "Dynamic Crack Detection in the Human Tibia Using Acoustic Emission," *Proceedings of the 28th International Workshop on Biomechanics Research: Experimental and Computational*, 2000.

Funk, J.R., Tourret, L.J., George, S.E., Crandall, J.R., "Axial Loading as an Injury Mechanism for Malleolar Fractures," *Proceedings of the Second Conference on the Development of Technology in Medicine in Virginia*, p. C-1, 1999.

INVITED PRESENTATIONS

Funk, J.R., "Mild Traumatic Brain Injury in Collegiate Football Players," *Traumatic Brain Injury Consortium*, Office of Homeland Security for the Texas A&M University System Health Science Center, College Station, Texas, January 9, 2008.

Funk, J.R., Duma, S.M., Manoogian, S.J., Rowson, S., "Biomechanical Risk Estimates for Mild Traumatic Brain Injury," *51st Annual Association for the Advancement of Automotive Medicine (AAAM) Conference*, Melbourne, Victoria, Australia, October 17, 2007.

Funk, J.R., "Biomechanics of the Extremities," Biomechanics of Injury, sponsored by the Association for the Advancement of Automotive Medicine (AAAM), Melbourne, Victoria, Australia, October 11, 2007.

Funk, J.R. and Luepke, P.A., "Trajectory Model of Occupants Ejected in Rollover Crashes," SAE 2007-01-0742, *2007 Society of Automotive Engineers (SAE) World Congress*, Detroit, MI, April 17, 2007.

Funk, J.R., "Biomechanics of the Extremities," Biomechanics of High-Impact Injuries, sponsored by the Association for the Advancement of Automotive Medicine (AAAM) and the National Transportation Safety Board (NTSB), NTSB Training Center, Ashburn, VA, April 2, 2007.

Funk, J.R., "Axial Loading of the Lower Extremity Long Bones," Injury Biomechanics: Advanced Technologies and New Frontiers, 5th Annual Center for Injury Biomechanics Instructional Symposium, Virginia Polytechnic and State University, Blacksburg, VA, March 23, 2007.

Funk, J.R., Duma, S.M., Manoogian, S., Rowson, S., "Development of Concussion Risk Curves Based on Head Impact Data from Collegiate Football Players," 34th International Workshop on Human Subjects for Biomechanical Research, Detroit, MI, November 5, 2006.

Funk, J.R., and Duma, S.M., "Biomechanical Risk Estimates for Concussion in Collegiate Football Players," 30th Annual Meeting of the American Society of Biomechanics (ASB), Blacksburg, VA, September 8, 2006.

Funk, J.R., "Lower Extremity Injuries in Motor Vehicle Crashes: The Forgotten Injury," *2006 Emerging Issues in Motor Vehicle Product Liability Litigation*, American Bar Association, Phoenix, AZ, April 6, 2006.

Funk, J.R., "Spine Injury Biomechanics," Automobile Safety and Injury Biomechanics, 4th Annual Center for Injury Biomechanics Instructional Symposium, Virginia Polytechnic and State University, Blacksburg, VA, October 14, 2005.

Funk, J.R., Crandall, J.R., "Estimation of Long Bone Bending Using Strain Gauges," 32nd International Workshop on Human Subjects for Biomechanical Research, Nashville, TN, October 31, 2004.

Funk, J.R., Kerrigan, J.R., Crandall, J.R., "Dynamic Bending Tolerance of the Human Femur," 48th Annual Association for the Advancement of Automotive Medicine (AAAM) Conference, Key Biscayne, FL, October 26, 2004.

Madeley, N.J., Srinivasan, C.M.S., Crandall, J.R., Hurwitz, S., Funk, J.R., "Retrospective Analysis of Malleolar Fractures in an Impact Environment," *48th Annual Association for the Advancement of Automotive Medicine (AAAM) Conference*, Key Biscayne, FL, October 26, 2004.

Funk, J.R., Cormier, J.M., Bain, C.E., "Analytical Model for Investigating Low-Speed Sideswipe Collisions," *2004 Society of Automotive Engineers (SAE) World Congress*, Detroit, MI, March 10, 2004.

Funk, J.R., "The Lower Extremity: Injury, Biomechanics and Disability," The Basics of Crash Injury and Biomechanics, Specialized Seminar sponsored by the Association for the Advancement of Automotive Medicine (AAAM), New Orleans, LA, October 16, 2003.

Funk, J.R., Rudd, R.W., Kerrigan, J.R., Crandall, J.R., "Analysis of Tibial Curvature, Fibular Loading, and the Tibia Index," *International Research Conference on the Biomechanics of Impact (IRCOBI)*, Lisbon, Portugal, September 25, 2003.

Funk, J.R., Srinivasan, S.C.M., Crandall, J.R., Khaewpong, N., Eppinger, R., Jaffredo, A.S., Potier, P., Petit, P., "The Effects of Axial Preload and Dorsiflexion on the Tolerance of the Ankle/Subtalar Joint to Dynamic Inversion and Eversion," *46th Stapp Car Crash Conference*, Ponte Vedra Beach, FL, November 12, 2002.

Funk, J.R., "Biomechanical Parameters of the Lower Extremities," The Biomechanics of Impact - Understanding the Limits of Human Tolerance, Specialized Seminar Course at the *46th Annual Conference for the Association for the Advancement of Automotive Medicine (AAAM)*, Tempe, AZ, September 29, 2002.

Funk, J.R., Rudd, R.W., Srinivasan, S.C.M., King, R.J., Crandall, J.R., Petit, P., "Methodology for Measuring Tibial and Fibular Loads in a Cadaver," *2002 Society of Automotive Engineers (SAE) World Congress*, Detroit, MI, March, 2002.

Funk, J.R., Crandall, J.R., Turret, L.J., MacMahon, C.B., Bass, C.R., Khaewpong, N., Eppinger, R.H., "The Effect of Active Muscle Tension on the Axial Injury Tolerance of the Human Foot/Ankle Complex," *17th International Technical Conference on the Enhanced Safety of Vehicles (ESV)*, Amsterdam, June 3-6, 2001.

Funk, J.R., Tournet, L.J., Crandall, J.R., “Estimation of Fibula Load-Sharing During Dynamic Axial Loading of the Lower Extremity,” *24th Annual Meeting of the American Society of Biomechanics (ASB)*, Chicago, IL, July 19-22, 2000.

Funk, J.R., Hall, G.W., Crandall, J.R., and Pilkey, W.D., “Quasi-Linear Viscoelasticity of Ankle Ligaments,” *23rd Annual Meeting of the American Society of Biomechanics (ASB)*, Pittsburgh, PA, October 21-23, 1999.

Funk, J.R., Hale, J.E., Carmines, D., Gooch, H.L., Hurwitz, S.R., “Biomechanical Evaluation of Fracture Healing in Normal and Diabetic Rats,” *21st Annual Meeting of the American Society of Biomechanics (ASB)*, Clemson, SC, September 24-27, 1997.