

# CURRICULUM VITAE

October, 2014

RONALD D. KRIZ

## I. GENERAL INFORMATION

**Education:** *Ph.D in Engineering Science and Mechanics*  
Virginia Polytechnic Institute and State University, Blacksburg, VA.  
September 1976 - December 1979.

*M.S. in Engineering Science and Mechanics,*  
Virginia Polytechnic Institute and State University,  
Blacksburg, VA.  
September 1974 - May 1976.

*B.S. in Aeronautical Engineering,*  
California Polytechnic State University,  
San Luis Obispo, CA.  
September 1968 - March 1974.

*A.A. in Mechanical Drafting,*  
Los Angeles Trade Technical College,  
Los Angeles, CA.  
September 1966 - June 1968.

### Appointments:

January 1990	<i>Associate Professor, retired</i>
September 2014	Department of Engineering Science and Mechanics Virginia Polytechnic Institute and State University, Blacksburg, VA

April 1982	<i>Materials Research Engineer (GS-15)</i>
December 1989	Fracture and Deformation Division National Institute of Standards and Technology, Boulder, CO.

January 1980	<i>Post-Doctoral Research Associate,</i>
March 1982	National Research Council-National Bureau of Standards, Fracture and Deformation Division, National Bureau of Standards, Boulder, CO.

September 1977 December 1979	<i>Graduate Research Associate,</i> NASA Langley-Virginia Tech Composites Cooperative Program NASA Langley Research Center, Hampton, VA.
September 1974 July 1977	<i>Graduate Research Assistant</i> Department of Engineering Science and Mechanics, Virginia Polytechnic Institute and State University Blacksburg, VA.
April 1974 May 1976	<i>Aircraft Structural Design Engineer,</i> Rockwell International, Los Angeles Aircraft Division, El Segundo, CA.

**Membership in Professional Organizations:**

- \* Scientific Research Society of North America, Sigma Xi.
- \* IEEE Computer Society
- \* American Society for Nondestructive Testing
- \* American Academy of Mechanics
- \* Association for Computing Machinery
- \* Association for the Advancement of Computing in Education

**Professional Honors:**

- \* Founding Fellow of the University Center for Human-Computer Interaction, 1995.
- \* Author of Advanced Communications and Information Technology Center, 1995.
- \* Certificate of Recognition NASA for U.S. Patent Application, 1994.
- \* Certificate of Recognition NIST for U.S. Patent Application, 1982.
- \* Honored Alumni at the Annual Review: Center for Composite Materials and Structures, Virginia Tech, 1985.
- \* First place: Western Regional AIAA Technical Paper, 1974.
- \* B.S., Outstanding graduating student, AIAA Student Chapter, 1974.
- \* B.S., Graduated with honors in Aeronautical Engineering, 1974.

**II. TEACHING ACTIVITIES Courses Taught** (Evaluations are summarized in Dossier):

- \* ESM 5014, Introduction to Continuum Mechanics
 

Fall	1990,	Enrollment 48.
Summer	1990,	Enrollment 5.
Fall	1991,	Enrollment 49.
Summer	1993,	Enrollment 12.
Fall	1993,	Enrollment 36.
Summer	1994,	Enrollment 15.
Fall	1994,	Enrollment 34.
Fall	2001,	Enrollment 27.
Fall	2002,	Enrollment 20.

- \* ESM 5344, Wave Propagation in Solids  
(<http://www.sv.vt.edu/classes/ESM5344/ESM5344.html>)
 

Spring	1990,	Enrollment 11.
Spring	1992,	Enrollment 9.
Spring	1994,	Enrollment 9.
Spring	1995,	Enrollment 10.
Spring,	1997,	Enrollment 7.
Spring	2002,	Enrollment 8.
Spring	2003,	Enrollment 7.
Spring	2004,	Enrollment 7.
  
- \* ESM 3054, Mechanical Behavior of Materials
 

Fall	1992,	Enrollment 32.
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- \* ESM 1004, Statics
 

Spring	1991,	Enrollment 32.
Spring	1991,	Enrollment 68.
Spring	1992,	Enrollment 36.
Summer	1992,	Enrollment 38.
Fall	1992,	Enrollment 54.
Fall	1996,	Enrollment 32.
Fall	1998,	Enrollment 39.
  
- \* ESM 2204, Mechanics of Materials  
(<http://www.sv.vt.edu/classes/ESM2204/ESM2204.html>)
 

Fall	1995,	Enrollment 24
Fall	2000,	Enrollment 38.
Spring	2000,	Enrollment 41.
Spring	2001,	Enrollment 41.
Spring	2004,	Enrollment 44.
Spring	2004,	Enrollment 58.
  
- \* ESM 4714, Scientific Visual Analysis  
(<http://www.sv.vt.edu/classes/ESM4714/ESM4714.html>)
 

Fall	1991,	Enrollment 13.
Spring	1992,	Enrollment 10.
Spring	1993,	Enrollment 18.
Spring	1994,	Enrollment 12.
Spring	1995,	Enrollment 18.
Spring	1996,	Enrollment 10.
Fall	1997,	Enrollment 15.
Fall	2000,	Enrollment 11.
Fall	2003,	Enrollment 7.

- \* MSE 2034, Elements of Materials Engineering  
 (<http://www.sv.vt.edu/classes/MSE2034.html>)  
 Fall 1993, Enrollment 54.  
 Fall 1994, Enrollment 69.  
 Fall 1995, Enrollment 58.  
 Fall 1996, Enrollment 45.  
 Fall 1997, Enrollment 42.
- \* MSE 2094, Analytic Methods in Material Science  
 (<http://www.sv.vt.edu/classes/MSE2094.html>)  
 Spring 1994, Enrollment 12.  
 Spring 1996, Enrollment 25.  
 Spring 1997, Enrollment 29.  
 Spring 1998, Enrollment 25.
- \* ESM/MSE 4984, Computer Simulation of Material Behavior  
 (<http://www.jwave.vt.edu/crcd/esmmse4984/>)  
 Fall 1998, Enrollment 7.
- \* ESM/MSE 5984, Computer Simulation of Mechanical Behavior of Materials  
 (<http://www.jwave.vt.edu/crcd/esmmse5984/>)  
 Spring 2000, Enrollment 8.

Teaching evaluation average for “overall effectiveness” = 3.43 all courses out of 4.00.

**Ph.D Dissertation Committees** (Employment after graduation is indicated in parentheses):

- \* “Modeling Nonlinear Material Behavior at the Nano and Macro Scales”, A.K. Nair, Chairman: R.D. Kriz, Co-chair: D. Farkas, Completed 5/12/2008 (Post Doc: MIT; Associate Professor, University of Arkansas)
- \* "Multiple Wave Scattering, Calculated Effective Stiffnesses, and Wave Properties in Unidirectional Fiber-Reinforced Composites", W.L. Liu, Chairman: R.D. Kriz, Completed 5/13/97 (Engineer: Sound Alliance: A Division of Dow Chemical)

**Masters Theses Committees** (Employment after graduation is indicated in parentheses):

- \* "Exploring and Envisioning Periodic Laminar Flow Around a Cylinder”, Miguel Dario Ortega Lopez (Co-chairs: R.D. Kriz, ESM and C.L. Dancy, ME), Completed 4/24/08 (Professor in Mechanical Engineering at the National Polytechnic University at Quito, Ecuador)
- \* "A Metrics Study in Virtual Reality”, A.A. Ray (Co-chair: S. Henry, C.S. and R.D. Kriz, ESM), Completed, 5/7/04 (Ph.D candidate in CS at Virginia Tech)

- \* "An Axisymmetric Finite Element Solution for Elastic Wave Propagation Through Threaded Connections", G. Land (Co-chair: R. Batra and R.D. Kriz), Completed, 12/19/96 (Engineer: Ingersol Rand)
- \* "Finite Element Analysis of Adiabatic Shear Bands in Impact and Penetration Problems", J. B. Stevens (Co-chair: R. Batra and R.D. Kriz), Completed 11/1/96 (Engineer: Alcatel).
- \* "Micromechanical Analysis of a High Volume Fraction, High Stiffness Ratio Macro-Composite", A Kuppuswamy (Co-chair: R. D. Kriz and V. Giurgiutiu), Completed, 1/20/97 (Engineer: Analytic Services NASA Langley).
- \* "Measurement of Ultrasonic Wave Mode Transition in Unidirectional Graphite/Epoxy Composites", Benoit Vandebossche. Chairman: R.D. Kriz, Completed 5/9/91 (Military Service: France)
- \* "Effect of Cooling Rate and Stacking Sequence on the Fatigue Behavior of Notched Quasi-isotropic APC-2 Laminates", N.S. Vure, Chairman: R.D. Kriz, Completed 8/7/93. (Engineer: Chrysler)
- \* "Parallel Implementation of The Filtered Back Projection Algorithm for Tomographic Imaging", Raman R.V. Rao. Co-chair: R.D. Kriz and A.L Abbott, Completed 1/5/95. (Scientific Staff: Bell Northern Res.)

**Advisor for NRC-NBS Post-Doctoral Program:**

- \* "Modeling Singularities of Cracks with FEM", P.R. Heyliger, 1986 - 1988.

**Ph.D. Dissertations and M.S. Theses in Progress.**

- \* "Research topic in the area of bioengineering", S. Parikh, ESM Ph.D, Co-chair with K. Granata.

**Senior Projects:**

- \* "Visualization of Electron Diffraction Patterns by Scattering from a Crystal", MSE, Fabienne J. Nichols, Spring 1992.
- \* "Diffusion Model for Predicting Localized Drug Treatment", S. Parikh, ESM, Fall 1995.

### III. RESEARCH ACTIVITIES

**Research Grants:** Italics indicates PI and parentheses enclose amount I was responsible.

- \* *D.R. Bevan*, L.T. Watson, and R.D. Kriz, “Application of Visualization and Haptic FeedBack to Enhance Molecular Docking”, Virginia Tech ASPIRES, Sept99 – Apr01, \$54,450 (\$1,000).
- \* *R.D. Kriz* and J.T. Kelso, “Extending the Use of Collaborative Virtual Environments to Engineering Design Using High Speed Networks”, Lockheed Martin Astronautics, 1mar00 – 31dec01, \$50,000 (\$50,000).
- \* *J. T. Kelso*, L.E. Arsenault, and R.D. Kriz, “"Device Independent Visualization Environment-Reconfigurable, Scalable, Extensible (DIVERSE) Toolkit", National Institute of Standards and Technology (NIST), 1apr99 – 31mar02, \$60,000 (\$20,000)
- \* *R.D. Kriz*, T. Morgan, J. Colbert, S. Macrae, “ Extending the Use of Collaborative Virtual Environments for Instruction in K-12 Schools”, Silicon Graphics Inc. and the Institute for Connecting Science Research to the Classroom, \$104,468 (\$104,468).
- \* *K.L. Reifsnider*, et al., Navy Collaborative Integrated Information Technology Initiative", Office of Naval Research, (Year-1: 14nov98 - 30sep99, Project: \$3M, VT-CAVE: \$381K) (Year-2: 1oct99 - 15may00, Project: \$2M, VT-CAVE: \$331K), (Year-3: 1apr01 - 31mar02, Project: \$1.5M, VT-CAVE: \$283K), (Year-4: 1apr02 – 31mar03, Project: \$1.5M, VT-CAVE: \$746K) (Year-5: 1apr03 – 31may04, Project: \$1.2M, VT-CAVE: \$162K), VT-CAVE CoPI: R.D. Kriz (\$1,903,000).
- \* *R.D. Kriz*, “Infrastructure Development and Planning Project to Explore the Benefits of a Collaborative Virtual Environment in Virginia Universities and Businesses”, Virginia’s Center for Innovative Technology (CIT) (6 months), May 9, 1998, \$29,000 (\$29,000)
- \* *R.D. Kriz*, R.C. Batra, J.K. Burton, W.A. Curtin, and D. Farkas, "Combined Research -- Curriculum Development: Computer Simulation of Material Behavior - From Atomistic to the Continuum Level", NSF (EEC-97008155), Apr 97 - Mar 99, \$220,000 (\$220,000).
- \* *R.D. Kriz*, K.L. Reifsnider, and J. Carroll, “Human Computer Interaction Visualization and Animation Groups”, NSF (CISE/ASC 836200), Oct 97 – Sep 98 \$25,000 (\$25,000).
- \* *D. Farkas*, R.C. Batra, W.A. Curtin, and R.D. Kriz, "Acquisition of a Computer/Visualization Server for the Center for Modeling and Simulation in Materials Science", AFOSR (VT97-0354-09), Mar 97, \$119,911 (\$50,000).

- \* *R.D. Kriz, et.al, "Breaking Research and Education Barriers by Developing 3-D Visualization CAVE(tm) Technology", NSF-ARI (CDA-9601874), Jan 97 – Jan 00, \$1,646,796 (\$1,646,796).*
- \* *R.D. Kriz, C.A. Beattie, and C.J. Ribbens, "Establishment of the Scientific Modeling and Visualization Classroom", SCHEV (\$70,000) with matching funding from Sun Microsystems Computer Company (\$70,000), VNI Software (\$50,000), September 1995, \$190,000\* (\$110,000\*).*
- \* *R.D. Kriz, "Visual Tooling in Computational Mechanics", Alcoa Foundation, Aluminum Company of America, August 1995, \$7,500 (\$7,500).*
- \* *V. Giurgiutiu and R.D. Kriz, "Mechanical Properties of Bio-absorbable materials", Smith and Nephew Richards, Inc., Jan 94 - Sept 94, \$33,000, (\$0).*
- \* *R.D. Kriz, "Value Metering Visualization: A New Design Methodology", John Deere, Dubuque, Iowa , Feb 94 - Apr 94, \$6,239, (\$6,239).*
- \* *R.D. Kriz and D.R. Bevan, "Educational Software Grant", Molecular Simulation, Inc., 1993, \$300,000 (\$150,000).*
- \* *R.D. Kriz, "Equipment Grant to the Laboratory for Scientific Visual Analysis", Virginia Institute for Material Systems, \$21,197, (\$21,197).*
- \* *R.D. Kriz, "Establishment of Digital Visualization Reference Center: Equipment, GRA and software", Digital Equipment Corporation, Mar 92 - Feb 93, \$61,000, (\$61,000).*
- \* *R.D. Kriz "Computer Tomography Material Evaluation", NASA Langley Reserach Center, Principal Investigator, Mar 92 - present (3years), \$54,229, (\$54,229).*
- \* *R.D. Kriz, "Effect of Crystallinity on the Long-Term Behavior of AS4/APC-2 Quasi-Isotropic Laminates", Virginia Institute for Material Systems, Jul 91 - Jun 93, \$83,877, (\$83,877).*
- \* *R.D. Kriz, "Establishment of the Laboratory for Scientific Visual Analysis", NSF-STC & VIMS (\$155,000), SUN Microsystems Computer Company (\$58,000) and Precision Visuals Inc. (\$20,000) software grant, August 1991, \$232,000, (\$232,000).*
- \* *J.I. Craig, K.C. Gramoll, and R.D. Kriz, "NSF-SUCCEED: The Development and Implementation of Interactive Multimedia in Basic Engineering Education Courses (Phase I &II, Engineering Mechanics Course)", Jul 92 - Oct 94, \$829,607, (\$156,015).*
- \* *J.E. McGrath, et. al., "Center for High Performance Polymeric Adhesives and Composites," National Science Foundation, Feb 91 - present (7 years), \$7,800,00, (\$134,151).*

- \* *R.D. Kriz*, "Measurement of Mode Transitions in Graphite Epoxy", Virginia Institute for Material Systems, Jul 90 - Jun 91, \$26,401, (\$26,401).
- \* R.M. Davis, H.W. Gibson, R.D. Kriz, A.C. Loos, *J.E. McGrath*, K.L. Reifsnider, J.S. Riffle, and J.P. Wightman, "Affordable Polymer Matrix Composites", McDonnell Douglas/ARPA, Sept 93 - Aug 95, \$993,760 (\$78,324).

**Patents:**

- \* "Method of Determining Load in Anisotropic Non-Crystalline Materials Using Energy Flux Deviation", W.H. Prosser, R.D. Kriz, and D.W. Fitting, US Patent 5,337,610, August 16, 1994.
- \* "Systems for Monitoring Load in Fiber-Reinforced Composite Materials", W.H. Prosser, R.D. Kriz, and D.W. Fitting, U.S. Patent 5,209,123, May 11, 1993.
- \* "Systems for Monitoring Changes in Elastic Stiffness in Composite Materials", R.D. Kriz, U.S. Patent 4,449,770, February 19, 1985.

**Special Projects:** (Three senior projects at California Polytechnic State Univ)

- \* "A Sailplane Wing Constructed of Foam Core and Fiberglass Skin", 1973.
- \* "Shear Flow in a Multi-Celled Sailplane Wing Constructed of Composite Materials", 1973.
- \* "Construction, Flight Certification, and Flight Test of a Sailplane N3773G", 1974.

**Projects Funded Within National Bureau of Standards:**

- \* "Embedded Optical Fiber Sensors in Tension Leg Offshore Oil Platforms", Principal Investigator, 1988-1989, Collaboration with Conoco Oil Company. 1/4 Man Year, \$50,000.
- \* "Installation of Computer Network and Computer Server and Workstation", Principal Investigator, 1988-1989, Equipment: \$50,000.
- \* NASA Ames Research Center, "Mechanical and Thermal Characterization of Al<sub>2</sub>O<sub>3</sub>-Reinforced PEEK Composite Specimens for Cryogenic Thermal Standoff Applications", 4 December 1986 to 30 December 1987, \$64,000, (\$64,000).
- \* Ball Aerospace Corporation, "Fatigue Tests of Al<sub>2</sub>O<sub>3</sub>-Reinforced Epoxy Thermal Isolation Straps", 29 January 1986 to 2 April 1987, \$10,000, (\$10,000).
- \* "Development of an Optical Diffraction Strain Measurement System", 1988-1989,



Co-investigator with J.R. Berger. Equipment: \$15,000.

- \* "Damage Modeling in Woven Composites", Five-year program with DOE on Materials for Fusion Energy Applications at Low Temperatures, 1982-1987, Co-Investigator with R.P. Reed, \$50,000/year.
- \* "Damage Modeling in Composites", August 1985-August 1986, Principal Investigator, \$50,000. IMSE Innovative Award 1985.

Note: \$50,000 was the support for a one year effort.

### **International Collaborations:**

- \* Japan Society for the Promotion of Science, Host: Professor Toshiyuki Oshima, Kitami Institute of Technology. Funded for 6-months by the Japanese government to visit Japan and work with Professor Oshima on problems relating to simulation-visualization of stress wave propagation and nondestructive evaluation of heterogeneous structures, 1996.
- \* Guest of Ecole Des Mines de Nantes, France. Scientific visualization consultant to university for the creation of a Scientific Visualization Laboratory, June 19 - July 1, 1994.
- \* Visiting Scholar Professor Toshiyuki Oshima, Kitami Institute of Technology. Funded for 12-month visit by the Japanese government to work at Virginia Tech with Prof. Ron Kriz on stress wave simulation of acoustic microscope measurements, June 1990 – May 1991.
- \* Swiss Federal Laboratories for Materials Testing, Dübendorf, Switzerland, Hosted Visiting Scientist W.J. Muster, Tested Composites at Cryogenic Temperatures, NIST 1983.
- \* Department of Physics, University of Cape Town, South Africa, Hosted Mr. Mecit Yaman, Ph.D student of Dr. M. Harting, the summer 2003 at Virginia Tech. Developed a new visualization technique for analyzing gradients of second order stress tensors measured by X-ray diffraction, 2003.

### **Publications submitted but not yet accepted:**

- 1) Etebari, A., Pierrakos, O., Shore, M., Logie, C. R., Kriz, R. D., and Vlachos, P. P., "An Immersive, Interactive Scientific Visualization Environment for the Analysis of Complex Flows", J. Computer Graphics and Applications, submitted 2003.

### **Refereed Journal and Conference Papers:** (presenter underlined; student status italics)

- 1) Nair, A.K., Kriz, R.D., Prosser, W.H., "An Analytic and Numerical Prediction of Energy Flux Deviation", Wave Motion, Vol. 51(7), pp. 1138-1148, 2014.

- 2) Yaman, M., Kriz, R.D., Harting, M., “Visualization of Stress Tensors Determined by Neutron Diffraction”, *J. Neutron Research*, Vol. 15(3), pp. 267-274, 2007.
- 3) Devaney, J.E, Satterfield, S.G., Hagedorn, J.G., Kelso, J.T., Peskin, A.P., George, W.L., Griffin, T.J., Hung, H.K., Kriz, R.D., “Science at the Speed of Thought”, pp. 1-24, *Ambient Intelligence for Scientific Discovery*, Lecture Notes in Computer Science, Vol. 3345, Springer, Berlin, Heidelberg, 2005.
- 4) Kriz, R.D., Farkas, D., Ray, A.A, and Kelso, J.T., "Visualization of Structure-Property Relationships: Spanning the Length Scales from Nano to Macro", Invited Paper, International Conference Proceedings on Computational and Experimental Engineering Science, Corfu, Greece, July 25-29, 2003.
- 5) Churcher, N., Irwin, W., and Kriz. R., “Visualizing class cohesion with virtual worlds”, Conferences in Research and Practice in Information Technology Series, Proceedings of the Australian symposium on Information visualization, Adelaide, Australia, Vol. 24, pp. 89–97, 2003.
- 6) Kelso, J.T., Satterfield S.G., Arsenault, L.E., Ketchan, P.M., and Kriz, R.D., "DIVERSE: A Framework for Building Extensible and Reconfigurable Device-Independent Virtual Environments and Distributed Asynchronous Simulations", *Presence*, Vol. 12, pp. 19-36, 2003.
- 7) Kriz, R.D., Farkas, D., Ray, A.A., Kelso, J.T., and Flanery, R.E. Jr., "Visual Interpretation and Analysis of HPC Nanostructure Models using Shared Virtual Environments", Conference Proceedings, *High Performance Computing: Grand Challenges in Computer Simulations 2003*, The Society for Modeling and Simulation International (SCS), San Diego, California, pp. 127-135, 2003.
- 8) Kriz, R.D., Farkas, D., Ray, A.A., Kelso, J.T., and Flanery, R.E. Jr., “Visual Interpretation and Analysis of HPC Nanostructure Models using Shared Virtual Environments”, *Modeling and Simulation Magazine*, Vol. 1, No. 4, pp. 9-10, 2003.
- 9) Morgan, T., Kriz, R.D., Howard, S., *Das-Neves F.*, and Kelso, J.T., “ Extending the Use of Collaborative Virtual Environments for Instruction to K-12 Schools”, *In>>sight*, Vol. 1 (Inaugural Issue), a journal published by the Institute for the Advancement of Emerging Technologies in Education, Charleston, West Virginia 25301, pp. 67-82, 2002.
- 10) Kelso, J.T., Arsenault, L.E., Satterfield, S.G., and Kriz, R.D., “DIVERSE: A Framework for Building Extensible and Reconfigurable Device Independent Virtual Environments”, *IEEE Virtual Reality 2002*, March 24-28, pp. 183-190, 2002.
- 11) Kriz, R.D., Farkas, D., Batra, R.C., Levensalor, R.T., Parikh, S.D., “Combined Research and Curriculum Development of Web-based Educational Modules on Mechanical Behavior of Materials”, *J. Materials Education*, Vol. 24 (1-3), pp. 41-52, 2002.

- 12) Kriz, R.D., Batra, R.C., and Farkas D., "Integrating Simulation Research into Curriculum Modules on Mechanical Behavior of Materials", *J. Materials Education*, Vol. (1&2), pp. 43-52, 1999.
- 13) *Liu, W.L.* and Kriz, R.D., "Axial shear waves in fiber-reinforced composites with multiple interfacial layers between fiber core and matrix", *Int. J. Mechanics of Materials*, Vol. 31, pp. 117-129, 1999.
- 14) *Liu, W.L.* and Kriz, R.D., "Shear Waves in Fiber-Reinforced Composites with Interfacial Cracks", *Int. J. Solids and Structures*, Vol. 35, No. 13, pp. 1425-1449, 1997.
- 15) *Liu, W.L.* and Kriz, R.D., "Multiple Wave Scattering in Fiber-Reinforced Composites: Micromechanical Viewpoint", *J. Wave Motion*, Vol. 27, No. 3, pp. 223-244, 1997.
- 16) R.D. Kriz and D. Farkas, "Using Materials Resources on the World Wide Web for Introductory Materials Science Teaching", *J. Materials Education*, Vol. 19, No. (1&2), pp.111-119, 1997.
- 17) *Ternes, J.K.*, Farkas, D., and Kriz, R.D., "Stoichiometry effects on core structure and mobility in B<sub>2</sub> NiAl", *Phil. Mag. A*, Vol. 72, No. 6, pp. 1671-1696, 1995.
- 18) *Vandenbossche, B.*, Kriz, R.D., and Oshima, T., "Stress Wave Displacement Polarizations and Attenuation in Unidirectional Composites: Theory and Experiment", *J. Research in Nondestructive Evaluation*, Vol. 8, No. 2, pp. 101-123, 1996.
- 19) *Vure, N.R.S.* and Kriz, R.D., "Effect of Cooling Rate and Stacking Sequence on the Fatigue Behavior of Notched Quasi-Isotropic AS4/PEEK Laminates", *J. Comp. Tech and Res*, Vol. 188, No. 2, pp. 127-134, 1995.
- 20) Tewary, V. K. and Kriz, R.D., "Generalized Plane Strain Analysis of a Bimaterial Composite Containing a Free Surface Normal to the Interface", *Journal of Material Research*, Vol. 13, pp. 2609-2622, 1991.
- 21) *Heyliger, P.R.* and Kriz, R.D., "Stress Intensity Factors by Mixed Enriched Finite Elements", *Communications in Applied Numerical Methods*, Vol. 28, pp. 1461-1473, 1989.
- 22) Kriz, R.D. and McCloskey, J.D., "Mechanical Properties of Alumina-PEEK Unidirectional Composite: Compression, Shear, and Tension", *Advances in Cryogenic Engineering Materials*, Vol. 36, Eds. R.P. Reed and F.R. Fickett, pp. 921-927, 1989.
- 23) Kriz, R.D., "Edge Stresses in Woven Laminates at Low Temperatures", *Composite Materials: Fatigue and Fracture*, Second Volume, ASTM STP 1012, Ed. Lagace, pp. 150-161, 1989.
- 24) Kriz, R.D. and Sparks, L.L., "Performance of Alumina/Epoxy Thermal Isolation Straps", *Advances in Cryogenic Engineering Materials*, Vol. 34, Eds. A.L. Clark and R.P. Reed, pp. 107-114, 1987.

- 25) Kriz, R.D., and Ledbetter, H.M., "Elastic Wave Surfaces in Anisotropic Media", *Rheology of Anisotropic Materials*, C. Huet, D. Bourgoïn, and S. Richemond, Eds., CEPADUES-Editions, Toulouse, France, pp. 79-91, 1986.
- 26) Kriz, R.D., and Muster, W.J., "Influence of Damage on Mechanical Performance of Woven Laminates at Low Temperatures", *Advances in Cryogenic Engineering Materials*, Vol. 32, Eds. R.P. Reed and A.F. Clark, pp. 137-144, 1986.
- 27) Kriz, R.D., "Influence of Damage on Mechanical Properties of Woven Composites at Low Temperatures", *Journal of Composites Technology and Research*, Vol., 7, No. 2, pp. 55-58, 1985.
- 28) Wnuk, M.P. and Kriz, R.D., "Continuous Damage Mechanics Model of Damage Accumulation in Laminated Composites", *International Journal of Fracture*, Vol. 28, pp. 121-138, 1985.
- 29) Kriz, R.D. and Ledbetter, H.M. "Elastic Representation Surfaces of Unidirectional Graphite/Epoxy Composites", *II U.S.-Japan Conference on Composite Materials, ASTM STP 864*, Eds. J.R. Vinson and M. Taya, American Society for Testing and Materials, Philadelphia, pp. 661-675, 1985.
- 30) Kriz, R.D., "Influence of Ply Cracks on Fracture Strength of Graphite/Epoxy Laminates at 76K", *Effects of Defects in Composite Materials*, ASTM STP 836, American Society for Testing and Materials, pp. 250-265, 1984.
- 31) Datta, S.K., Ledbetter, H.M., and Kriz, R.D. "Calculated Elastic Constants of Composites Containing Anisotropic Fibers", *International Journal of Solids and Structures*, Vol. 20, No. 5, pp. 429-438, 1984.
- 32) Ledbetter, H.M., Datta, S.K., and Kriz, R.D., "Elastic Constants of an Anisotropic Nonhomogeneous Particle-Reinforced Composite", *Acta Met.*, Vol. 32, No. 12, pp. 2225-2231, 1984.
- 33) Kriz, R.D., "Stiffness and Internal Stresses of Woven Composites at Low Temperatures", *Advances in Cryogenic Engineering Materials*, Vol. 30, Eds. A.L. Clark and R.P. Reed, Plenum Press, pp. 1-8, 1983.
- 34) Ledbetter, H.M. and Kriz, R.D., "Elastic-Wave Surfaces in Solids", *Physica Status Solidi*, Vol. 114, pp. 475-480, 1982.
- 35) Kriz, R.D. and Stinchcomb, W.W., "Effects of Moisture Curing Stresses and Mechanical Load on Damage Development in Quasi-Isotropic Laminates", *Damage in Composite Materials*, ASTM STP 775, Ed. K.L. Reifsnider, American Society for Testing and Materials, pp 63-80, 1982.

- 36) Kasen, M.B., Schramm, R.E., and Kriz, R.D., "Effect of Cryogenic Temperatures on the Mechanical Performance of Glass-Fabric-Reinforced Epoxy and Polyimide Matrix Laminates", *Advances in Cryogenic Engineering Materials*, Vol. 28, Plenum Press, pp. 1-7, 1981.
- 37) Kriz, R.D., "Absorbed Moisture and Stress-Wave Propagation in Graphite/Epoxy", *Composite Technology Review*, Vol. 3, No. 4, pp 154-155, 1981.
- 38) Kriz, R.D. and Stinchcomb, W.W., "Elastic Moduli of Transversely Isotropic Graphite Fibers and Their Composites", *Journal of Experimental Mechanics*, Vol. 19, No. 2, 41-49, Feb 79.

**Papers Presented at Conferences and Published in Conference Proceedings** (abstract reviewed): (presenter underlined; student status italics)

- 1) Kelso, J.T., Arsenault, L.E., Kriz, R.D., and Das-Neves, F., "DIVERSE: a Software Toolkit to Integrate Distributed Simulations and Heterogeneous Virtual Environments", Joint Aerospace Weapon Systems: Support, Sensors, and Simulations Symposium Exhibition, San Diego, CA, July 22-27, 2001.
- 2) Etebari, A., Vlachos, P.P., and Kriz, R.D., "Development of a Virtual Scientific Visualization Environment for the Analysis of Complex Flows in the Cardiovascular System", BED-Vol. 50, Bioengineering Conference ASME, 2001.
- 3) Kriz, R.D., Levensalor, R.T., Parikh, S.D., "Interactive Scientific Visual Data Analysis Using Java, PV-Wave, and IMSL," Conference Proceedings of the "Visualization Development Environment 2000", Princeton Plasma Physics Laboratory, April 27-28, 2000.
- 4) Kriz, R.D., Levensalor, R.T., Parikh, S.D., "Combined Research Curriculum Development of Web and Java Based Educational Modules with Immersive Environments," Kluwer Academic Publishers, Conference Proceedings of the International Conference on Building University Electronic Educational Environments, University of California Irvine, August 4-6, 1999.
- 5) Jorgenson, L., Kriz, R.D., Mones-Hattal, B., Fracchi, F.D., "Is Visualization Struggling under the Myth of Objectivity?" (<http://www.cecm.sfu.ca/projects/PhilVisMath/vis95panel.html>), Proceedings of IEEE Visualization' 95, IEEE Computer Society Press, pp. 412-425, 1995.
- 6) Kuppaswamy, A. and Kriz, R.D., "Development of an Interactive Multimedia Module That Create a Visual Model of Beam Theory", *Proceedings of ED-MEDIA 95 World Conference on Educational Multimedia and Hypermedia*, Graz, Austria, June 17-21, Published by Association for the Advancement of Computing in Education, pp. 384-389, 1995.
- 7) Oshima, T., Kriz, R.D., and Nomachi, S.G., " Visual Simulation of Stress Wave Propagation in Fiber Sensor with Interphase Layer in Composite Laminate", *36th Structures, Structural Dynamics, and Materials Conference*, April 10-13, New Orleans, accepted 1995.

- 8) Giurgiutiu, V., Reifsnider, K.L., Kriz, R.D., *Ahn, B.K.*, and *J. J. Lesko*, "Influence of Fiber Coating and Interphase on the Design of Polymeric Composite Strength - Analytical Predictions", *36th Structures, Structural Dynamics, and Materials Conference*, April 10-13, New Orleans, Paper # 95-1212, accepted 1995.
- 9) Oshima, T., Mikami, S., Aochi, T. , Takeda, N. and Kriz, R.D., " Dynamic Behavior of Interphase Layer in Stress Wave Propagation Through a Fiber Sensor System" , *Proceedings 7th Japan-U.S. Conference on Composite Materials*, Kyoto, Japan, Eds. I. Kimpara, H. Miyairi and N. Takeda, Published by Japan Society for Composite Materials, pp 223 - 230, (1995).
- 10) Oshima, T., Mikami, S. and Rahman, M.S., Yasuda, M., Kriz, R.D., " Accuracy Improvement of Ultrasonic Inspection for Civil Structures and Materials" , *Review of Progress in Quantitative NDE, Vol. 14*, Eds. D.O. Thompson and D.E. Chimenti, Plenum Press, pp. 2193-2200, 1995.
- 11) Xie, Z.Y., Kriz, R.D., Farkas, D., "Visualization of Dislocation Core Structure and Motion in Ordered Alloys" , *TMS 122nd Annual Conference*, February 21-25, EPD Congress, Ed. J.P. Hager, Published by The Minerals, Metals & Materials Society, pp. 679-685, 1992.
- 12) Kriz, R.D., "AVS Functional Visualization: Extracting Functions from Distributed Numbers" , *2nd Annual AVS Conference*, Lake Buena Vista, Fla, May 24-26, 8 pages, 1993.
- 13) Oshima, T., Kriz, R.D., Takahasi, Y., Nomachi, S.G., and S. Mikami, "Simulation and Visualization of Stress Wave Propagation in a Composite with Interphase Layer and a Small Defect" , *Proceedings of the Sixth Japan-U.S. Conference on Composite Materials*, Technomic Publishing Co., pp. 551-559, 1993.
- 14) Oshima, T., Kriz, R.D., and Nomachi, S.G., "Simulation and Visualization of Stress Wave Propagation in Composite Laminate with Interphase Layer" , *Proceedings of the Fifth International Symposium on Nondestructive Characterization of Materials*, Karuizawa, Japan, Gordon Breach Scientific Publishers, Nondestr. Test. Eval., Vol.8-9, pp. 391-403, 1992.
- 15) Tewary, V.K. and Kriz, R.D., "Green's Function Method for Calculation of Stress Fields in Composite Materials" , *International Union of Theoretical and Applied Mechanics*, Springer-Verlag, pp. 341-353, 1992.
- 16) Kriz, R.D., Oshima, T., and Nomachi, S.G., "Scanning Acoustic Microscope Simulation for Determining Interphase Structure" , *International Union of Theoretical and Applied Mechanics*, Springer-Verlag, pp. 395-412, 1992.
- 17) Prosser, W.H., Kriz, R.D., and Fitting, D.W., "Nonlinear Elastic Effects on the Energy Flux Deviation of Ultrasonic Waves in GR/EP Composites" , *Review of Progress in Quantitative NDE*, Vol. 11, Eds. D.O. Thompson and D.E. Chimenti, Plenum Press, pp. 2041-1048, 1991.
- 18) Kriz, R.D. and Gary, J.M. "Numerical Simulation and Visualization Models of Stress Wave Propagation in Graphite Epoxy Composites" , *Review of Progress in Quantitative NDE*, Vol. 9, Eds. D.O. Thompson and D.E. Chimenti, pp. 125-132, 1990.

- 19) Prosser, W.H., Kriz, R.D., and Fitting, D.W., "Effect of Stress on Energy Flux Deviation of Ultrasonic Waves in Gr/Ep Composites", *IEEE 1990 Ultrasonics Symposium*, IEEE Press, pp. 961-964, 1990.
- 20) Kriz, R.D., "Computer Simulation and Visualization of Stress Wave Propagation: A Visualization Approach for Developing new Nondestructive Test Methods", *Conference Proceedings of the Virginia Computer Users Conference*, Virginia Tech, Blacksburg, VA, pp. 21-30, 1990.
- 21) R.D. Kriz and Heyliger, P.R., "Finite Element Model of Stress Wave Topology in Unidirectional Graphite/Epoxy Composites: Wave Velocities and Flux Deviations", *Review of Progress in Quantitative NDE*, Vol. 8A, Eds. D.O. Thompson and D.E. Chimenti, Plenum Press, pp. 141-148, 1989.
- 22) Fitting, D.W., Kriz, R.D., and Clark, A.V., "Measuring In-plane Elastic Moduli of Composites with Arrays of Phased-Insensitive Ultrasound Receivers", *Review of Progress in Quantitative NDE*, Vol. 8B, Eds. D.O. Thompson and D.E. Chimenti, Plenum Press, pp. 1497-1504, 1989.
- 23) Berger, J.R. and Kriz, R.D., "An Optical Diffraction Strain Measurement System", *Conference Proceedings of 1989 Spring Conference on Experimental Mechanics*, Society of Experimental Mechanics, Bethel, Connecticut, pp. 572-576, 1989.
- 24) Read, D.T., Kriz, R.D. and Williams, J.G., "Multimode Optical Fibers as Damage Sensors in Composite Rods", *Ninth International Conference on Offshore Mechanics and Arctic Engineering*, ASME paper No. OMAE-90-894, American Society of Mechanical Engineers, 1989.
- 25) Kriz, R.D., "Monitoring Elastic Stiffness Degradation in Graphite/Epoxy Composites", *Solid Mechanics Research for Quantitative Non-Destructive Evaluation*, J.D. Achenbach and Y. Rajapakse, Eds., Martin Nijhoff Publishers, pp. 389-395, 1987.
- 26) Kriz, R.D. and Ledbetter, H.M., "Elastic Representation Surfaces of Unidirectional Graphite-Magnesium", *Conference Proceedings Nondestructive Testing and Evaluation of Advanced Materials and Composites*, NTIAC DOD Information Analysis Centers, pp. 63-76, 1986.
- 27) Cardenas-Garcia, J.F., Moulder, J.C., and Kriz, R.D., "Video-Optical Determination of Whole-Field Strain in a Composite Panel", *Conference Proceedings, Published by Society for Experimental Mechanics*, pp. 48-57, 1986.
- 28) Ledbetter, H.M., Datta, S.K., Kriz, R.D., and Austin, M.W., "Physical-Property Modeling in Silicon-Carbide/Aluminum", *Conference Proceedings of the Sixth Annual Discontinuous Reinforced Metal-Matrix-Composite Work (DOD MMCIAC)*, Santa Barbara, California, pp. 67-94, 1984.

### **Internal Reports and Contractor Reports:**

(Note: When rewritten reports become archival publications, they are not listed below.)

- \* Tewary, V.K. and R.D. Kriz, "Effect of a Free Surface on Stress Distribution in a Bimaterial Composite", NIST Special Publication 802, National Institute of Standards and Technology, U.S. Gov. Printing Office, Washington, D.C., March 1991.
- \* Kriz, R.D., "Mechanical Properties of Alumina Fiber-Reinforced PEEK Thermal Plastic at Low Temperature", NASA Contractors' Report, submitted 1990.
- \* Kriz, R.D., "Laminated Plate Analysis for Low Temperature Applications: Metallic and Nonmetallic Laminates", Internal Report NBSIR 87-3067, National Bureau of Standards, Boulder, Colorado, pp. 321-341, 1987.
- \* Kriz, R.D., Stinchcomb, W.W. and Tenney, D.R., "Effects of Moisture Residual Thermal Curing Stresses and Mechanical Load on the Damage Development in Quasi-Isotropic Laminates", Virginia Tech Report No. VPI-E-80-5, Ph.D. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA, December, 1979.
- \* Kriz, R.D., "Effect of Material Properties on Interlaminar Stresses in Angle-Ply Composite Laminates", Virginia Tech Report No. VPI-77-16, Virginia Polytechnic Institute and State University, Blacksburg, VA, 1977.
- \* Kriz, R.D. and Stinchcomb, W.W., "Mechanical Properties for Thick Fiber-Reinforced Composite Materials Having Transversely Isotropic Fibers", Virginia Tech Report No. VPI-E-77-77-3, Masters Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA, 1977.

**Web publications in html format.** (URL web addresses are enclosed in parentheses and highlighted by italics). Note: 1. the Graduate School at Virginia Tech will require all Masters Theses and Ph.D. Dissertations be submitted in html format, 2. the Library of Congress as well as many publishers are considering html formatted documents as archival publications.

- 1) Kriz, R.D., Glaessgen and Macrae, J.D., "Eigenvalue-Eigenvector Glyphs: Visualizing Zeroth, Second, Fourth and Higher Order Tensors in a Continuum" ([http://www.sv.vt.edu/NCSA\\_WkShp/kriz/WkShp\\_kriz.html](http://www.sv.vt.edu/NCSA_WkShp/kriz/WkShp_kriz.html) ), Proceedings of the NCSA-NIST Workshop on Modeling the Development of Residual Stresses During Thermoset Composites Curing (<http://www.ncsa.uiuc.edu/Apps/SE/research/cure/workshop.html>), University of Illinois, Urbana-Champaign, September 15-16, 1995.
- 2) Rao, R.P.V., Kriz, R.D., Abbott, A.L. and Ribbens, C.J., "Parallel Implementation of the Filtered Back Projection Algorithm for Tomographic Imaging" ([http://www.sv.vt.edu/xray\\_ct/Parallel\\_CT.html](http://www.sv.vt.edu/xray_ct/Parallel_CT.html)), Masters Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 40 pages, January 1995. (note: prior to VT-ETD)



- 3) Kriz, R.D., *Three Visual Methods: Gradients, Function Extraction, and Tensor-Glyphs* (<http://www.sv.vt.edu/classes/ESM4714/VizMtd.html>), Book registered copyright with the Library of Congress, 1993, published as class notes for ESM4714 Scientific Visual Analysis and Multimedia, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 198 pages, 9246 animation frames, 1991-1995.

**Invited Talks or Lectures:**

- \* Keynote, Undersea Weapon Simulation Based Design Workshop, “Virtual and Collaborative Design Environments”, Office of Naval Research, University of Maryland, June, 2001.
- \* International Conference on Materials for Advanced Technologies, “Combined Research and Curriculum Development of Web Based Educational Modules on Mechanical Behavior of Materials”, Organized by Materials Research Society, Singapore July, 2001.
- \* Keynote, Silicon Exchange Seminar Series, "Visual Data Analysis", Silicon Graphics Inc, 1995. Keynote Speaker, Discovery Seminar Series, "Visual Data Analysis", Visual Numeric Inc. (formerly IMSL) , 1995.
- \* Naval Research Laboratory Scientific Visualization Laboratory, Washington, D.C, August 1993
- \* Georgia Institute of Technology, Atlanta Georgia, September 1992.
- \* Scientific Computing and Automation Conference, Washington, D.C., October 1992.
- \* National Institute for Standards and Technology, Gaithersburg, Maryland, August 1992.
- \* National Computer Graphics Association, Chicago, Illinois, August 1991.
- \* Visualization 91, San Diego, California, October 1991.
- \* IUTAM Symposium on Local Mechanics Concepts for Composite Material Systems, November 1991.
- \* Johns Hopkins University, "Wave Propagation in Anisotropic Media", Center for Nondestructive Evaluation, May 1991.
- \* Scientific Computing and Automation Conference, Philadelphia, PA, September 1990.
- \* U.S. Army Research Office Workshop on Recent Advances in the Mathematical Theory of Anisotropic Elasticity and Applications", Research Triangle Park, North Carolina, June 4-6, 1990.
- \* National Computer Graphics Association Annual Conference, Anaheim, CA, March 1990.

- \* NASA Langley Research Center, Materials Division, "Woven Composites Damage Mechanics", Hampton, VA, February 1987.
- \* NASA Workshop on Sensor Technology for Intelligent Materials, NASA Langley Research Center, Hampton, VA, February 1987.
- \* Distinguished Alumnus at Virginia Tech, Annual Review: Center for Composite Materials and Structures, April 1985.
- \* Nineteenth Annual French Group on Rheology of Anisotropic Materials, Paris, France, November 1984.
- \* International Conference on Composite Materials (ICCM-IV), Tokyo, Japan, October 1982.
- \* Naval Research Laboratories, Material Science and Technology Division, "Moisture Effects in Graphite/Epoxy Composites", July 1981.
- \* National AIAA Student Technical Paper Competition, Washington, D.C., December 1974.

#### **IV. SERVICE ACTIVITIES**

##### **University Activities:**

- \* NCSA-SGI Power Grid Alliance 1995-1998.
- \* University Computing and Communications Committee , 1995-1996.
- \* Created first Web Home page with BEV for the University, 1992.
- \* First University Affiliate in Virginia with NSF's NCSA, (National Center Supercomputing Applications) 1991.
- \* Founding Fellow of the University Center for Human-Computer Interaction 1995.
- \* CCMS Database Committee, Chairman 1991-1995.
- \* Founder of the Laboratory for Scientific Visual Analysis 1991.
- \* Cofounder of the Multimedia Laboratory of the College of Engineering and College of Architecture and Urban Studies 1991.
- \* ESM Computer Committee 1990-2003.
- \* ESM External Relations Committee 1990-1992.
- \* MSE Computer Committee, Chairman 1993-1998.
- \* MSE Undergraduate Curriculum Committee 1993-1998.

## Service to Profession:

\* Technical Reviews for:

AFOSR Proposals, 1995.

International Journal of Fracture Mechanics, 1993.

Journal of Applied Mechanics: 1987, 1988

Advances in Cryogenic Engineering Materials: 1985, 1986, 1987

Journal of Nondestructive Testing: 1990

Journal of Intelligent Material Systems and Structures: 1991.

Journal of Composite Materials: 1991.

\* Conference Sessions Chaired:

Virtual Environment Workshop, Sponsored by Virginia Tech, August 2001. Organized Session on VRML and 3D Model Translation/Optimization.

International Conference on Materials for Advanced Technologies, Organized by Materials Research Society, Singapore July, 2001. Chaired session on Web based teaching.

31st Annual Technical Meeting of the Society of Engineering Science, October 1994. Chaired session "Computational Issues in Composite Materials and Structures".

Sixth Japan-U.S. Conference on Composite Materials, Orlando Florida, June 1992. Chaired Session "Micromechanics I".

International Union of Theoretical and Applied Mechanics: Local Mechanics Concepts for Composite Material Systems, Blacksburg, VA, October, 1991. Program Chairman.

Review of Progress on Quantitative Nondestructive Evaluation, La Jolla, CA, July 15-20, 1990. Chaired session "New Techniques I (mostly electromagnetic)".

Second U.S.-Japan Symposium on Composite Materials, NASA Langley Research Center, Hampton, VA. June 6-8, 1983. Chaired session, "Short Fiber Composites".

International Conference of Composite Materials, ICCM-IV, Tokyo, Japan, September 1982. Chaired session, "Mechanical properties of Composites".