Curriculum Vitae

WAYNE L. ELBAN

Education:

PhD (Applied Sciences: Metallurgy), University of Delaware, 1977
Thesis: Adsorption and Surface Relaxation Phenomena in Iron - 3 Pct Silicon
MS (Engineering Materials), University of Maryland, 1972
BChE with Distinction, University of Delaware, 1969
Thesis: The Effect of Sulfur Adsorption on the Oxidation of 3% Silicon Iron

Work Experience:

2008-2011	Guest Worker (part-time), Materials Science and Engineering Laboratory, Polymers Division, National Institute of Standards and Technology, Gaithersburg, MD
2001-2003	Working Visitor (part-time), Smithsonian Museum Conservation Institute (formerly Smithsonian Center for Materials Research and Education), Suitland, MD
1996-2020	Professor, Department of Engineering (formerly Electrical Engineering and Engineering Science followed by Engineering Science), Loyola University Maryland (formerly Loyola College in Maryland), Baltimore, MD (Retired 2020)
1994-2001	Chair, Department of Electrical Engineering and Engineering Science, Loyola College in Maryland, Baltimore, MD
1993	Materials Research Engineer (part-time; appointed under Intergovernmental Personnel Act), Energetic Materials Division, Naval Surface Warfare Center (NSWC), White Oak, Silver Spring, MD
1992	Fulbright Scholar (Grant-in-Aid), University of Strathclyde, Department of Pure and Applied Chemistry, Physical Chemistry Section (Organic Crystal Growth), Glasgow, SCOTLAND
1985-1996	Associate Professor, Department of Electrical Engineering and Engineering Science, Loyola College in Maryland, Baltimore, MD
1985	Instructor, Chemical and Nuclear Engineering Department, University of Maryland, College Park, MD

1986-1990 Materials Research Engineer (part-time; appointed under Intergovernmental Personnel Act), Energetic Materials Division, NSWC, White Oak, Silver Spring, MD

1985-1986 Materials Research Engineer (part-time), Energetic Materials Division, NSWC, White Oak, Silver Spring, MD

1977-1985 Materials Research Engineer, Energetic Materials Division, NSWC, White Oak, Silver Spring, MD

1976-1977 Research Chemical Engineer, Explosives Division, Naval Surface Weapons Center (also NSWC), White Oak, Silver Spring, MD

1974-1976 Research Fellow, College of Engineering, University of Delaware, Newark, DE

1973-1974 Teaching Assistant/Instructor for Metallurgy, Materials Science Undergraduate Laboratory, College of Engineering, University of Delaware, Newark, DE

1971-1972 Guest Worker (part-time), Institute for Materials Research, National Bureau of Standards, Washington, D.C.

1970 Junior Professional Trainee, Naval Ordnance Laboratory (NOL), White Oak, Silver Spring, MD

1969-1973 Research Chemical Engineer, Chemical Engineering Division, NOL, White Oak, Silver Spring, MD

Book chapter:

1. "Dislocations in Energetic Crystals," R.W. Armstrong and W.L. Elban, in *Dislocations in Solids*, Vol. 12, Eds.: F.R.N. Nabarro and J.P. Hirth (Amsterdam: Elsevier), 2004, pp. 405-446.

Publications -- articles in journals:

1. "Nano-indentation Hardness and Strain Hardening of Silicon, Sodium Chloride, and Tungsten Crystals," R.W. Armstrong, W.L. Elban, and S.M. Walley, *Experimental Mechanics*, 62 (2022), pp. 359-364.

2. "The Micro- to Nano-scale Dislocation Mechanics of (001) MgO Crystal Hardness," R.W. Armstrong and W.L. Elban, *Philosophical Magazine Letters* (2021), DOI:10.1080/09500839.2021.1973683.

3. “Dislocation Reaction Mechanism for Enhanced Strain Hardening in Crystal Nano-indentations,” R.W. Armstrong and W.L. Elban, *Crystals* 2020, 10, 9; doi:10.3390/cryst10010009.

4. “Crystal Strengths at Micro- and Nano-scale Dimensions,” R.W. Armstrong and W.L. Elban, *Crystals* 2020, 10, 88; doi:10.3390/cryst10020088.

5. “Exceptional Crystal Strain Hardening Determined Over Macro- to Micro- to Nano-size Scales in Continuous Spherical Indentation Tests,” R.W. Armstrong and W.L. Elban, *Materials Science & Engineering A*, 757 (2019), pp. 95-100.

6. "Determination of the Mechanical Properties of Historic Wrought Iron Wire from the Wheeling Suspension Bridge Main Cable," K.V. Organ, W.L. Elban, and R.E. Smelser, *Historical Metallurgy*, 47 (for 2013; published 2015), pp. 153-162.

7. "Elastic, Plastic, Cracking Aspects of the Hardness of Materials," R.W. Armstrong, W.L. Elban, and S.M. Walley, *International Journal of Modern Physics B*, Vol. 27 (2013), that is accessible at (http://www.worldscientific.com/doi/abs/10.1142/S0217979213300041).

8. "Hardness Properties across Multiscales of Applied Loads and Material Structures," R.W. Armstrong and W.L. Elban, *Materials Science and Technology*, 28 (2012), pp. 1060-1071.

9. "Deformation-Induced Hot-Spot Consequences of AP and RDX Crystal Hardness Measurements," R.W. Armstrong, S.G. Bardenhagen, and W.L. Elban, *International Journal of Energetic Materials and Chemical Propulsion*, Vol. 11 (2012), pp. 413-425.

10. “Influence of Solvent Washing on Interlayer Structure of Alkylammonium Montmorillonites,” W.L. Elban, J.A. Howarter, M.C. Richardson, P.E. Stutzman, A.M. Forster, A.J. Nolte, and G.A. Holmes, *Applied Clay Science*, Vol. 61 (2012), pp. 29-36.

11. “Macro- to Nano-indentation Hardness Stress-Strain Aspects of Crystal Elastic/Plastic/Cracking Behaviors,” R.W. Armstrong and W.L. Elban, *Experimental Mechanics*, Vol. 50 (2010), pp. 545-552.

12. “Metallurgical Characterization of Refrigeration Tubing Formed from Plain Carbon Steel Strip Stock,” W.L. Elban and K.F. Rowe, *Journal of Manufacturing Processes*, Vol. 10 (2008), pp. 89-95.

13. “Thermal Performance of Aluminum and Glass Beer Bottles,” R.T. Bailey and W.L. Elban, *Heat Transfer Engineering*, Vol. 29 (2008), pp. 643-650.

14. “Materials Science and Technology Aspects of Energetic (Explosive) Materials,” R.W. Armstrong and W.L. Elban, *Materials Science and Technology*, Vol. 22 (2006), pp. 381-395.

15. "Metallurgical Investigation of an Iron Cable Wire in a Gries-Gendell (Severson) Girder," W.L. Elban and M. Goodway, *APT Bulletin: The Journal of Preservation Technology*, Vol. XXXV (2004), pp. 17-26.

16. "Inclusions in 19th Century American Wrought Iron Structural Cables," W.L. Elban and M. Goodway, *Historical Metallurgy*, Vol. 37 (2003), pp. 106-120.

17. "Investigation of Hot Spot Characteristics in Energetic Crystals," R.W. Armstrong, H.L. Ammon, W.L. Elban, and D.H. Tsai, *Thermochimica Acta*, 384 (2002), pp. 303-313.

18. "Use of Energetic Material Properties for Modeling Dynamic/Shock Wave Processes," R.W. Armstrong and W.L. Elban, *Chemical Physics* (Translation of Russian journal name), Vol. 20, No. 10 (2001), pp. 53-57.

19. "AFM Observations of Growth Sector Structure on a Cleaved RDX Crystal," J. Sharma, C.S. Coffey, R.W. Armstrong, W.L. Elban, and M.Y.D. Lanzerotti, *Chemical Physics* (Translation of Russian journal name), Vol. 20, No. 8 (2001), pp. 50-54.

20. "Nanofractography of Shocked RDX Explosive Crystals with Atomic Force Microscopy," J. Sharma, R.W. Armstrong, W.L. Elban, C.S. Coffey, and H.W. Sandusky, *Applied Physics Letters*, 78 (2001), pp. 457-459.

21. "Plastic Anisotropy and Cracking at Hardness Impressions in Single Crystal Ammonium Perchlorate," W.L. Elban and R.W. Armstrong, *Acta Materialia*, Vol. 46 (1998), pp. 6041-6052.

22. "Plasticity/Interfacial Energy Influences on Combustion-Driven Cracking of RDX Energetic Crystals," W.L. Elban, R.W. Armstrong, and T.P. Russell, *Philosophical Magazine A*, Vol. 78 (1998), pp. 907-912.

23. "Metallurgical Assessment of Historic Wrought Iron: U.S. Custom House, Wheeling, West Virginia," W.L. Elban, M.A. Borst, N.M. Roubachewsky, E.L. Kemp, and P.C. Tice, *APT Bulletin: The Journal of Preservation Technology*, Vol. XXIX (1998), pp. 27-34.

24. "Quasi-Static Compaction of Porous Propellant Beds. II. Experiments and Application of Lattice Compaction Model to Cannon Propellants," H.W. Sandusky and W.L. Elban, *Powder Technology*, 89 (1996), pp. 219-229.

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26. "Microstructural Basis for Enhanced Shock-Induced Chemistry in Single Crystal Ammonium Perchlorate," W.L. Elban, H.W. Sandusky, B.C. Beard, and B.C. Glancy, *AIAA Journal of Propulsion and Power*, 11 (1995), pp. 24-31.

27 "Vickers Hardness Testing of Sucrose Crystals," W.L. Elban, D.B. Sheen, and J.N. Sherwood, *Journal of Crystal Growth*, 137 (1994), pp. 304-308. (Special issue containing papers presented at the Ninth American Conference on Crystal Growth).

28. "Defect Density Measurements in Shocked Single Crystal Ammonium Perchlorate by X-ray Photoelectron Spectroscopy," B.C. Beard, H.W. Sandusky, B.C. Glancy, and W.L. Elban, *Journal of Materials Research*, 7 (1992), pp. 3266-3274.

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30. "The Effect of Nitroglycerin Content on the Quasi-Static Compaction Behavior of Various Ball Propellants," W.L. Elban, P.J. Coyne, Jr., and R.L Campbell, *Propellants, Explosives, and Pyrotechnics*, 19 (1991), pp. 255-265.

31. "Crystal Size Dependence for Impact Initiation of RDX Explosive," R.W. Armstrong, C.S. Coffey, V.F. DeVost, and W.L. Elban, *Journal of Applied Physics*, 68 (1990), pp. 979-984.

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35. "X-ray Reflection Topographic Study of Growth Defect and Microindentation Strain Fields in an RDX Explosive Crystal," W.L. Elban, R.W. Armstrong, K.C. Yoo, R.G. Rosemeier, and R.Y. Yee, *Journal of Materials Science*, 24 (1989), pp. 1273-1280.

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37. "Quantitative Evidence for Nitroso Compound Formation in Drop - Weight Impacted RDX Crystals," J.C. Hoffsommer, D.J. Glover, and W.L. Elban, *Journal of Energetic Materials*, 3 (1985), pp. 149-167.

38. "Quasi-Static Compaction Study of Coarse HMX Explosive," W.L. Elban and M.A. Chiarito, *Powder Technology*, 46 (1986), pp. 181-193.

39. "X-Ray Topography Evidence for Energy Dissipation at Indentation Cracks in MgO Crystals," K.-C. Yoo, R.G. Rosemeier, W.L. Elban, and R.W. Armstrong, *Journal of Materials Science Letters*, 3 (1984), pp. 560-562.

40. "Fractoemission from Cyclotrimethylenetrinitramine (RDX) Explosive Single Crystals," J.T. Dickinson, M.H. Miles, W.L. Elban, and R.G. Rosemeier, *Journal of Applied Physics*, 55 (1984), pp. 3994-3998.

41. "Quasi-Static Compaction Studies for DDT Investigations: Ball Propellants," W.L. Elban, *Propellants, Explosives, and Pyrotechnics*, 9 (1984), pp. 119-129.

42. "X-Ray Orientation and Hardness Experiments on RDX Explosive Crystals," W.L. Elban, J.C. Hoffsommer, and R.W. Armstrong, *Journal of Materials Science*, 19 (1984), pp. 552-566.

43. "Adiabatic Heating at a Dislocation Pile-Up Avalanche," R.W. Armstrong, C.S. Coffey, and W.L. Elban, *Acta Metallurgica*, 30 (1982), pp. 2111-2116.

44. "Aluminum Matrix Composite Elasticity Measured Ultrasonically," G.V. Blessing and W.L. Elban, *Journal of Applied Mechanics*, 48 (1981), pp. 965-966, (Brief Note).

45. "Surface Energies of High Explosives PETN and RDX from Contact Angle Measurements," W.L. Elban, *Journal of Materials Science* (Letter to the Editor), 14 (1979), pp. 1008-1011.

46. "On the Formulation of the Zero Creep Method for Small Diameter Wires," M.D. Greenberg, J.N. Pryor, and W.L. Elban, *Materials Science and Engineering*, 33 (1978), pp. 63-67.

47. "Adsorption, Surface Energy and Crystal Growth in Iron-3 Pct Silicon," W.L. Elban, M.A. Hebbar, and J.J. Kramer, *Metallurgical Transactions*, 6A (1975), pp. 1929-1937.

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1. "From Intermolecular Shearing to Composite Predictions for Initiation of Energetic Materials," R.W. Armstrong and W.L. Elban, in *Proceedings of 14th International Detonation Symposium*, 2010, www.intdetsymp.org/detsymp2010/viewmanuscripts.aspx, ID# 20819.

2. "Wrought Iron Wire from the Wheeling Suspension Bridge: a Metallurgical Assessment," W.L. Elban and M. Goodway, in *Proceedings of 2001 Materials Research Society Fall Meeting, Materials Issues in Art and Archaeology VI*, Materials Research Symposium Proceedings 712 (2002), pp. 511-523.

3. "Sub-Molecular Fracture Steps in Shock-Shattered RDX Crystals and Follow-On Nano-Indentation Evaluation of Early Stage Plasticity," J. Sharma, C.S. Coffey, R.W. Armstrong, W.L. Elban, and S.M. Hoover, in *Shock Compression of Condensed Matter - 2002*, American Institute of Physics Conference Proceedings 620 (2002), pp. 837-840.

4. "Influence of Microcracking on Pressure-Dependent Energetic Crystal Combustion," R.W. Armstrong, C.F. Clark, and W.L. Elban, in *Combustion of Energetic Materials* (Eds.: K.K. Kuo and L.T. De Luca), Begell House, Inc., New York and Wallingford, U.K. (2002), pp. 354-359.

5. "Wrought Iron Wire in Early Structural Cables: The Intersection of an Ancient Material with a Modern Technology," M. Goodway and W.L. Elban, in *Proceedings of the 5th International Conference on the Beginnings of the Use of Metals and Alloys (BUMA-V)*, Korean Institute of Metals and Materials (2002), pp. 211-216.

6. "Nanostructure of Defects and Hot Spots of Explosives as Revealed by an Atomic Force Microscope," J. Sharma, R.W. Armstrong, W.L. Elban, and C.S. Coffey, in *Proceedings of the 11th (International) Symposium on Detonation*, Omnipress, Omnipro-CD (2000), pp. 443-450.

7. "Dislocation Characteristics in Energetic Crystals," R.W. Armstrong and W.L. Elban, in *Shock Compression of Condensed Matter - 1999*, American Institute of Physics Conference Proceedings 505 (1999), pp. 723-726.

8. "Nanostructure of Porosity (and Entrapped Solvent Effects) in Laboratory-Grown Crystals of RDX as Revealed by an AFM," J. Sharma, C.S. Coffey, R.W. Armstrong, W.L. Elban, and M.Y.D. Lanzerotti, in *Shock Compression of Condensed Matter - 1999*, American Institute of Physics Conference Proceedings 505 (1999), pp. 719-722.

9. "Dislocation Mechanics Aspects of Deformation-Induced Detonations and Dynamic Deformations," R.W. Armstrong, W.L. Elban, D.H. Tsai, and F.J. Zerilli, in *Proceedings of International Workshop on New Models and Numerical Codes for Processes in Condensed Media (1998)*, pp. 123-127 plus 12 figures.

10. "Structure of Crystal Defects in Damaged RDX as Revealed by an AFM," J. Sharma, S.M. Hoover, C.S. Coffey, A.S. Tompa, H.W. Sandusky, R.W. Armstrong, and W.L. Elban, in *Shock Compression of Condensed Matter - 1997*, American Institute of Physics Conference Proceedings 429 (1997), pp. 563-566.

11. "Thermomechanical Aspects of Energetic Crystal Combustion," R.W. Armstrong, W.L. Elban, A.L. Ramaswamy, and C.Cm. Wu, in *Challenges in Propellants and Combustion: 100 Years after Nobel*, Ed. K.K. Kuo (New York and Wallingford (U.K.): Begell House, Inc., 1997), pp. 313-336.

12. "Metallographic Examination and Vickers Microindentation Hardness Testing of Historic Wrought Iron from the Wheeling Custom House," W.L. Elban, M.A. Borst, N.M.

Roubachewsky, E.L. Kemp, and P.C. Tice, in *Microstructural Science, Volume 24: Understanding Microstructure: Key to Advances in Materials (Proceedings of the 29th Annual Technical Meeting of the International Metallographic Society)*, June 1997, pp. 177-183.

13. "Quasi-Static Compaction of Large-Caliper Granular Gun Propellant," D.E. Kooker, H.W. Sandusky, W.L. Elban, and P.J. Conroy, in *Ballistics '95 (15th International Symposium on Ballistics)*, Vol. 3 (1995), pp. 1-9.

14. "Full-Scale Quasi-Static Compaction of Granular Solid Propellant," D.E. Kooker, H.W. Sandusky, W.L. Elban, and P.J. Conroy, in *Proceedings of the 31st JANNAF Combustion Subcommittee Meeting*, Vol.I, CPIA Publ. 620 (1994), pp. 137-154.

15. "Energetic Crystal Lattice-Dependent Responses," H.L. Ammon, R.W. Armstrong, Z.Y. Du, X.J. Zhang, and W.L. Elban, in *Structure and Properties of Energetic Materials*, Materials Research Society Symposium Proceedings Vol. 296 (1993), pp. 227-232.

16. "Comparison of Deformation and Shock Reactivity for Single Crystals of RDX and Ammonium Perchlorate," H.W. Sandusky, B.C. Beard, B.C. Glancy, R.W. Armstrong, and W.L. Elban, in *Structure and Properties of Energetic Materials*, Materials Research Society Symposium Proceedings Vol. 296 (1993), pp. 93-98.

17. "Quantitative Correlation of XPS Linewidth with Dislocation Density in Shocked Loaded Ammonium Perchlorate," B.C. Beard, H.W. Sandusky, B.C. Glancy, and W.L. Elban, 14th Symposium on Applied Surface Analysis, *Surface and Interface Analysis*, 20 (1993), pp. 140-148.

18. "Dislocation Density Variation in Shocked Single Crystal Ammonium Perchlorate," B.C. Beard, J. Sharma, H.W. Sandusky, B.C. Glancy, and W.L. Elban, in *Shock Compression of Condensed Matter - 1991*, Eds.: S.C. Schmidt, R.D. Dick, J.W. Forbes, and D.G. Tasker (Amsterdam: North Holland, 1991), pp. 571-574.

19. "Deformation and Shock Loading Studies on Single Crystals of Ammonium Perchlorate Relating to Hot Spots," H.W. Sandusky, B.C. Glancy, D.W. Carlson, W.L. Elban, and R.W. Armstrong, in *Proceedings of the Ninth Symposium (International) on Detonation*, Vol. II, Office of the Chief of Naval Research, OCNR 113291-7 (1991), pp. 1260-1270.

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21. "Compaction and Compressive Reaction Studies for a Spherical Double-Base Ball Propellant," H.W. Sandusky, B.C. Glancy, R.L. Campbell, A.D. Krall, W.L. Elban, and P.J. Coyne, Jr., in *Proceedings of the Twenty-Fifth JANNAF Combustion Meeting*, Vol. I, CPIA Publ. 498 (1988), pp. 83-94.

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24. "The Effect of Particle Size on the Quasi-Static Compaction Behavior of Granular HMX Beds," W.L. Elban, P.J. Coyne, Jr., and M.A. Chiarito, in *Proceedings of the 1987 JANNAF Propulsion Systems Hazards Subcommittee Meeting*, Vol. I, CPIA Publ. 464 (1987), pp. 61-76.

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29. "Dislocation Aspects of Plastic Flow and Cracking at Indentations," R.W. Armstrong and W.L. Elban, in *Microindentation Techniques in Materials Science and Engineering*, Eds.: P.J. Blau and B.R. Lawn (Philadelphia: ASTM, 1986), ASTM STP 889, pp. 109-126.

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2. "Comparison of Deformation and Shock Reactivity for Single Crystals of RDX and Ammonium Perchlorate," H.W. Sandusky, B.C. Glancy, B.C. Beard, W.L. Elban, and R.W. Armstrong, Extended Abstract and Poster Sheets presented at the *ONR/LANL Workshop on the Fundamental Physics and Chemistry of Combustion, Initiation, and Detonation of Energetic Materials*, CPIA Publ. 589 (1992), pp. 463-481.

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6. "Deformation Studies on Ammonium Perchlorate Relating to Shock Initiated Reaction," W.L. Elban, Abstract and Viewgraphs presented at the *ONR Workshop on Dynamic Deformation, Fracture, and Transient Combustion*, CPIA Publ. 474 (1987), pp. 35-45.

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8. "Microstructural Understanding of Hot Spots and Decomposition in Deformed Cyclotrimethylenetrinitramine (RDX) Explosive," W.L. Elban, J.C. Hoffsommer, and R.W. Armstrong; Abstract and Viewgraphs presented at *ONR Workshop on Dynamic Deformation, Fracture, and Transient Combustion*, CPIA Publ. 482 (1988), pp. 75-106.

9. "Microstructural Origins of Hot Spots and Decomposition in Deformed RDX Explosive," W.L. Elban, R.G. Rosemeier, K.-C. Yoo, and R.W. Armstrong; Abstract and Viewgraphs presented at *ONR Workshop on Dynamic Deformation, Fracture, and Transient Combustion*, CPIA Publ. 404 (1984), pp. 81-104.

Publications -- articles in National Educators' Workshop proceedings and on MatEdU Website [In 2023, http://www.materialseducation.org was migrated to the Micro Nano Technology Education Center (MNT-EC) Website, https://www.micronanoeducation.org. The first five papers can now be accessed in Materials Science Technology Education under ATE Partners.]

1. "Vickers Microindentation Hardness Characterization of Work Hardening in Cold-drawn Copper Wire," M. Goddard, K. Langham, M. Williams, M. Scully, J. Buquicchio, and W.L. Elban appears as a materials education module (2019) at (http://materialseducation.org/educators/matedu-modules/).

2. "Rockwell Hardness Testing of Steel Reinforcing Bar to Obtain Estimates of Tensile Strength," T.M. Robinson, M.T. Kalensky, A.M. Stanzel, N.J. Gordon, and W.L. Elban, appears as a materials education module (2016) at (http://materialseducation.org/educators/matedu-modules/).

3. "Assessing the Behavior of Balsa Wood in Three-point Bend Testing to Fulfill ABET Outcome (b)," W.L. Elban, appears as a materials education module (2015) at (http://materialseducation.org/educators/matedu-modules/.

4. "Viscosity of Household Fluids," W.L. Elban, appears as a materials education module (2014) at (http://materialseducation.org/educators/matedu-modules/.

5. "Vickers Microindentation Hardness Testing of Brazed Joints in Aluminum," P.B. Roy, F.M. O'Connell, T.H. Callahan, E.J. Armellino, and W.L. Elban, presented at the 2012 National Educators' Workshop, appears as a materials education module (2013) at (http://materialseducation.org/educators/matedu-modules/).

6. "Rockwell Hardness Testing of Metals/Alloys and Developing Computer-based Mechanical Property Correlations," W.L. Elban, in *Proceedings of the 20th National Educators' Workshop NEW: Update 2005 Standard Experiments in Engineering Materials Science and Technology*, Eds.: J. Jacobs, W. Wong-Ng, G. Holmes, and R. Kayser, NIST CD-ROM (January 2007), no pagination.

7. "Ethanol-Water Phase Diagram," W.L. Elban, in *Proceedings of the 18th National Educators' Workshop NEW: Update 2003 Standard Experiments in Engineering Materials Science and Technology*, NASA/CP-2004-213243/PT2 (2004), pp. 577-593.

8. "Fishing Line Knot Tying Contest: A Freshmen Experience," in *Proceedings of the 16th National Educators' Workshop NEW: Update 2001 Standard Experiments in Engineering Materials Science and Technology*, W.L. Elban and D.L. Frantz, NASA/CP-2002-211735 (2002), pp. 149-170.

9. "Fracture Behavior of Nylon Monofilament Fishing Line," in *Proceedings of the 15th National Educators' Workshop NEW: Update 2000 Standard Experiments in Engineering*

Materials Science and Technology, W.L. Elban, NASA/CP-2001-211029 (2001), pp. 81-112.

10. "Effect of Temperature on the Impact Behavior and Dimensional Stability of Thermoplastic Polymers," W.L. Elban and M.J. Elban, in *Proceedings of the National Educators' Workshop NEW: Update 99 Standard Experiments in Engineering Materials Science and Technology*, NASA/CP-2000-210325 (2000), pp. 121-143.

11. "Accelerated Aging Study of ABS Copolymer," W.L. Elban, S.N. Hornung, and M.C. Reinhardt, in *Proceedings of the National Educators' Workshop NEW: Update 99 Standard Experiments in Engineering Materials Science and Technology*, NASA/CP-2000-210325 (2000), pp. 75-100.

12. "Metallurgical Evaluation of Historic Wrought Iron to Provide Insights into Metal-Forming Operations and Resultant Microstructure," W.L. Elban and M.A. Elban, *in National Educators' Workshop: Update 96 Standard Experiments in Engineering Materials Science and Technology*, NASA Conference Publication 3354 (1997), pp. 27-51.

13. "Microstructural Preparation and Examination of Polymer-Matrix Composites," W.L. Elban, M.M. Rutzebeck, R.A. Small, and A.M. Walsh, in *National Educators' Workshop: Update 95 Standard Experiments in Engineering Materials Science and Technology*, NASA Conference Publ. 3305 (1996), pp. 55-68.

14. "Stereographic Projection Analysis of Fracture Plane Traces in Polished Silicon Wafers for Integrated Circuits," W.L. Elban, in *National Educators' Workshop: Update 94, Standard Experiments in Engineering Materials Science and Technology*, NASA Conf. Publ. 3304 (1995), pp. 101-121.

15. "PC Laser Printer-Generated Cubic Stereographic Projections with Accompanying Student Exercise," P.J. Coyne, Jr., G.S. Kohne, and W.L. Elban, in *National Educators' Workshop: Update 94, Standard Experiments in Engineering Materials Science and Technology*, NASA Conf. Publ. 3304 (1995), pp. 79-100.

16. "Three-Point Bend Testing of Poly(Methyl Methacrylate) and Balsa Wood," W.L. Elban, in *National Educators' Workshop: Update 93, Standard Experiments in Engineering Materials Science and Technology*, NASA Conf. Publ. 3259 (1994), pp. 373-390.

Publications – Editorial in internet journal volume:

1. "Crystal Indentation Hardness," R.W. Armstrong, S.M. Walley, and W.L. Elban, *Crystals* 2017, *7*(1), 21; doi:10.3390/cryst7010021, appears at http://www.mdpi.com/2073-4352/7/1/21. (9 pages; 6 figures)

Other scholarly activities (often involving collaboration with other researchers):

Technical presentations and abstracts (scientific societies, conferences, workshops, and seminars): 93

Loyola University Maryland technical reports: 1

Loyola University Maryland technical memorandum: 1

U.S. Government (Naval Surface Weapons Center) technical reports: 13

U.S. Government (Naval Surface Warfare Center) technical oral presentations: 32

U.S. patents and patent disclosures: 2

Courses taught at Loyola University Maryland:

Introduction to Engineering (three-week materials engineering module): EG 101
Statics (formerly Engineering Mechanics I): EG 301
Introduction to Engineering Materials: EG 351
Materials Science Lab: EG 051
Thermodynamics (formerly Engineering Thermodynamics): EG 380
Experimental Methods: EG 390
Engineering Materials and Manufacturing Processes: EG 423
Engineering Systems Analysis: EG 441
Structure of Solids: EG 453
Mechanical Properties of Materials: EG 454
Transformations in Solids: EG 455
Special Topics in Materials Engineering: Microstructural Characterization of Materials (formerly Optical Microscopy of Materials): EG 459
Materials Science Research: old EG 459
Introduction to Engineering Design: EG 490
Engineering Design Lab I and II: old EG 495 and old EG 496
Engineering Design Project I: EG 497

Committee assignments at Loyola University Maryland:

National Fellowships: Fulbright Grant (2004-present) and Goldwater Scholarships Coordinator (1993-2004); Athletic Council (2002-2003; 2009-2010); Study Abroad and International Students (1993-1994); Committee on Studies (1993-1994); Faculty Development (1988-1992)

Professional affiliations and honorary societies:

ASM International
Society of Manufacturing Engineers (SME)
Phi Kappa Phi
Tau Beta Pi

Outside interests:

Reformed Theology
Gardening
Photography
Woodworking

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