

Curriculum Vitae

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Education

- 1) Doctor of Arts, Mathematics. University of Illinois at Chicago, 1982.
- 2) Master of Science, Mathematics. University of Illinois at Urbana-Champaign, 1977.
- 3) Bachelor of Science, Mathematics. State University of New York at Buffalo, 1975.

Experience

- 1) 1982–Present: Professor of Mathematics, University of Wisconsin-Eau Claire.
- 2) 2011–2012: Visiting Professor of Mathematics, Macalester College.
- 3) 1990–1991: Visiting Professor of Mathematics, Washington University in St. Louis.
- 4) 1998–1999: Visiting Professor of Mathematics, Boston University.

Published Papers

- 1) with G.W. Don, K.K. Muir, and G.B. Volk. Music: Broken Symmetry, Geometry, and Complexity. *Notices of the American Mathematical Society*, **57**(2010), 30–49. Available at
<http://www.ams.org/notices/201001/rtx100100030p.pdf>
- 2) with R.C. Guido and P.S. Addison, Time-Frequency Analysis of Biosignals, *IEEE Engineering in Medicine and Biology Magazine* (2009), **28**(5), 14–29.
- 3) with X. Cheng and J.V. Hart. Time-frequency analysis of musical rhythm. *Notices of the American Mathematical Society*, **56**(2009), 344–360. Available at
<http://www.ams.org/notices/200903/rtx090300356p.pdf>
- 4) Wavelet-based Image Processing. *Applicable Analysis*, **85** (2006), 439–458.
- 5) with Amanda J. Potts. Time-frequency Spectra of Music. *Proceedings of 4th International Congress of ISAAC (International Society for Analysis, its Applications and Computation)*, World Scientific (2005), 487–493.
- 6) An Elementary Resolution of the Liar Paradox. *The College Mathematics Journal*, **35** (2004), 105–111.
- 7) with Susan E. Kelly. Efficient Signal Transmission and Wavelet-based Compression. *The UMAP Journal*, **24** (2003), 24–36.
- 8) New methods in wavelet-based image denoising. *Proc. of Third Int'l Conf. of Int'l Soc. for Analysis, its Applications and Computations*. World Scientific (2003), 370–377.
- 9) Tree-adapted wavelet shrinkage. *Advances in Imaging and Electron Physics*, Academic Press, **24** (2002), 343–394.
- 10) with Jeremy F. Alm. Time-frequency analysis of musical instruments. *SIAM Review*, **44** (2002), 457–476.

- 11) Combined image compressor and denoiser based on tree-adapted wavelet shrinkage. *Optical Engineering*, **41** (2002), 1520–27.
- 12) with Truong Q. Nguyen and Ying-Jui Chen. A low-power, low-memory System for wavelet-based image compression. *Recent Research Developments in Optical Engineering*, **5** (2002), 111–126.
- 13) Fourier series. *Encyclopedia of Physical Science and Technology, Third Edition*, Academic Press, **6** (2002), 167–183.
- 14) with Truong Q. Nguyen. Wavelet-based image compression, *Handbook of Transforms and Data Compression*, (Eds. K.R. Rao and P.C. Yip), Taylor & Francis, Chap. 6 (2001), 267–311.
- 15) with Y.-J. Chen. Image denoising using tree-based wavelet subband correlations and shrinkage. *Optical Engineering*, **39** (2000), 2900–2908.
- 16) with Truong Q. Nguyen. Adaptive scanning methods for wavelet difference reduction in lossy image compression. *IEEE Int'l Conf. on Image Proc. 2000*, **3** (2000), 182–185.
- 17) Lossy image codec based on adaptively scanned wavelet difference reduction. *Optical Engineering*, **39** (2000), 1891–1897.
- 18) Fourier analysis and wavelet analysis. *Notices of the Amer. Math. Society*, **44** (1997), 658–670.
- 19) Computer modeling of wave phenomenon. *Proc. of 1996 Conference at UW-La Crosse on Mathematical Modeling in the Undergraduate Curriculum*, (1996), 358–366.
- 20) A new bit reversal algorithm. *IEEE Transactions on Acoustics, Speech, and Signal Processing*, **38** (1990), 1472–1473.
- 21) A new proof of a theorem of Lelong. *Complex Variables*, **11** (1989), 257–259.

Published Books

- 1) *A Primer on Wavelets and their Scientific Applications, Second Edition*. Chapman & Hall/CRC Press, Boca Raton, 2008.
- 2) *A Primer on Wavelets and their Scientific Applications, First Edition*. Chapman & Hall/CRC Press, Boca Raton, 1999.
- 3) *Fast Fourier Transforms, Second Edition*. CRC Press, Boca Raton, 1996.
- 4) *Fast Fourier Transforms, First Edition*. CRC Press, Boca Raton, 1991.
- 5) *Fourier Analysis*. Oxford University Press, Oxford, 1988.

In Preparation

- 1) *Mathematics and Music: Composition, Perception, and Performance*. Interdisciplinary book on Mathematics and Music, co-author: Gary W. Don (UW-Eau Claire, Dept. of Music). Publication date: April 17, 2013.

Computer Software Programmed

I have programmed the following six computer software packages for research and teaching purposes.

- 1) FAWAV Software for performing Fourier and wavelet analysis, developed in conjunction with my book *A Primer on Wavelets and their Scientific Applications*, 1999–present.
- 2) IMCOMPBB Low-memory image compression software produced under subcontract with UC-San Diego, 2002.
- 3) COMPDEN Image compression and denoising software produced under subcontract with UC-San Diego, 2002.
- 4) IMCOMP Image compression software produced under subcontract with Boston University, 2001.

- 5) FAS Software for Fourier analysis accompanying my book *Fast Fourier Transforms, Second Edition*, 1996.
- 6) DIFFEQ Software for solving differential equations, 1996.

Recent Talks

- 1) Mathematics and Music, Univ. of St. Thomas, May 2012.
- 2) Mathematics and Music, St. Olaf College, April 2012.
- 3) Image Compression, Macalester College, April 2012.
- 4) Mathematics and Music, Macalester College, March 2012.
- 5) Image Compression, Taiwan University, March 2012.
- 6) Mathematics and Music, Taiwan University, March 2012.
- 7) Professional Development on Mathematics and Music, Taiwan American School, March 2012.
- 8) Convocation Address on Mathematics and Music, Illinois College, February 2012.

Teaching

I have taught courses at all levels of undergraduate mathematics, including College Algebra, Pre-Calculus, Introduction to Mathematical Thinking (a Liberal Arts, math appreciation course), Finite Mathematics, Calculus I and II, Linear Algebra, Differential Equations, Fourier Analysis, Fourier Optics, Digital Signal Processing, and Digital Image Processing. I have also taught seminars and independent studies, in Fast Fourier Transforms, Fourier Optics, Difference Equations, and Wavelets. While originally I employed a traditional lecture-based format for my teaching, I have recently been developing a synthesis of lecture and collaborative learning methods, which I call LECREWTA (Lecture and Collaborative Review with Technological Assistance). In 2001, I received an Outstanding Teacher designation (with salary adjustment) from the UWEC Mathematics Department.

Online Courses

I have taught online courses for several years. These courses include Finite Mathematics, Intermediate Algebra, and College Algebra, and Mathematics and Music. Most of these courses were taught through the online program of Florida Institute of Technology. The Mathematics and Music classes were taught in the summer online program of UW-Eau Claire.

Computer Languages

I am proficient in the following computer languages: VISUAL BASIC, MATLAB, MAPLE, L^AT_EX.

Courses Created

I have created three courses that I teach at UWEC:

- 1) MATHEMATICS AND MUSIC An introduction to the connections of mathematics and music. Course webpage is at:

www.uwec.edu/walkerjs/MandM/

- 2) DIGITAL SIGNAL PROCESSING An introductory DSP course, emphasizing audio processing using Fourier analysis. Course webpage is at:

www.uwec.edu/walkerjs/DSP/

- 3) DIGITAL IMAGE PROCESSING A comprehensive introduction to DIP, including the latest methods of wavelet analysis. Course webpage is at:

www.uwec.edu/walkerjs/DigImProc/

Grants & Awards Received

- 1) Participating member of NSF SUREPAM Mathematics REU program (P.I. Mohamed Elgindi) for Summer 2007, Summer 2008, and Summer 2009 at UWEC.
- 2) UWEC Excellence in Scholarship Award, 2002.
- 3) Sub-contract with University of California–San Diego, *Image Compression for Unmanned Underwater Vehicles*, Office of Naval Research project supervised by Truong Q. Nguyen, Jan. 2002–July 2002.
- 4) Sub-contract with Boston University, *Image Compression for Unmanned Underwater Vehicles*, Office of Naval Research project supervised by Truong Q. Nguyen, Dec. 2000–July 2001.
- 5) My book, *A Primer on Wavelets and their Scientific Applications*, received an *Outstanding Academic Book for 1999* award from *Choice* magazine.