

## Vita

### **Robert Ernest White** **Emeritus Professor of Mathematics** **North Carolina State University**

#### **Educational Record**

Northern Illinois University, 1968, B.S., Mathematics (Physics Minor)  
University of Massachusetts, 1971, M.S., Mathematics  
University of Massachusetts, 1973, Ph.D., Mathematics

#### **Professional Record**

University of Massachusetts, Amherst, Massachusetts, 1968-1973  
Teaching Assistant, Part-time Lecturer, Teaching Associate  
North Carolina State University, Raleigh, North Carolina, 1973-1979  
Assistant Professor of Mathematics  
Michigan State University, East Lansing, Michigan, 1979-1980  
Visiting Associate Professor of Mathematics  
North Carolina State University, Raleigh, North Carolina, 1979-1989  
Associate Professor of Mathematics (with tenure)  
Argonne National Laboratory, Argonne, Illinois, 1986-1987  
Visiting Staff Scientist  
University of Bologna, Bologna, Italy, June 1987  
Visiting Professor  
North Carolina State University, Raleigh, North Carolina, 1989-2013  
Professor of Mathematics  
North Carolina State University, Raleigh, North Carolina, 2013-  
Emeritus Professor of Mathematics

#### **Research Activities**

**(a). Doctoral Dissertation:**

"Linear Differential Operators with Interior Regularity"  
University of Massachusetts, 1973  
Adviser: Professor Y. W. Chen

**(b). Research Papers:**

"A characterization of hypoelliptic differential operators with variable coefficient," *Proc. of Amer. Math. Soc.*, vol. 46, no. 3, Dec. 1974, pp.375-382.

"Weak solution of  $(r(x,u(x)))' = (Fu)'(x)$  with  $r(0,u(0))u'(0) = ku(0)$ ,  $r(L,u(L))u'(L) = hu(L)$  and  $k,h$  suitable elements of  $[0,1]$ ," *J. of Math. Anal. Appl.*, March 1979, vol. 68, no.1, pp.157-170.

"Value set at  $x$  for an arbitrary distribution with applications to differential equations," *SIAM J. on Math. Anal.*, Jan. 1980, vol. 11, no.1, pp.61-72.

"Weak solutions of  $(p(x)u'(x))' + g(x)u'(x) + qu(x) = f$  with  $q,f \in H^{-1}[a,b]$ ,  $0 < p(x) \in L^\infty[a,b]$ ,  $g(x) \in L^\infty[a,b]$  and  $u \in H^1[a,b]$ ," *SIAM J. on Math. Anal.*, Nov. 1979, vol.10, no. 6, pp.1313-1321.

"A semilinear boundary value problem," *J. on Math. Anal.*, August 1979, vol. 70, no. 2, pp.563-578.

"A semilinear boundary value problem with nonincreasing nonlinear terms," *J. of Nonlinear Analysis*, 1980, vol.4, no.1, pp.123-138.

"Interior regularity operators," *Analysis Mathematica*, 1981, vol. 7, no. 3, pp.217-233.

"An enthalpy formulation of the Stefan problem," *SIAM J. on Num. Anal.*, Dec. 1982, vol. 19, no. 6, pp.1129-1157.

"Numerical solution of the enthalpy formulation of the Stefan problem," *SIAM J. on Num. Anal.*, Dec. 1982, vol. 19, no. 6, pp.1158-1172.

"A modified finite difference scheme for the Stefan problem," *Math. Comp.*, Oct. 1983, vol. 41, no.164, pp.337-347.

(with Mori and Verghese) "Applications of the finite element method to a linear diffusion problem with reversible trapping and eroding boundary," *Ann. Nuclear Energy*, 1983, vol. 10, no.11, pp.579-587.

"Alloy solidification: uniqueness, existence and numerical approximation," *SIAM J. Num. Anal.*, April 1985, vol. 22, no.2, pp. 205-244.

(with D. P. O'Leary) "Multisplittings of matrices and parallel iterative methods," *SIAM J. Alg. and Disc. Meth.*, Oct. 1985, vol.6, no. 4, pp.630-640.

"Parallel algorithms for nonlinear problems," *SIAM J. Alg. and Disc. Meth.*, Jan. 1986, vol. 7, no.1, pp.137-149.

"A nonlinear parallel algorithm with application to the Stefan problem," *SIAM J. Num. Anal.*, June 1986, vol. 23, no.3,pp.639- 652.

"Multisplittings and parallel iterative methods," *Computer Meth. in Appl. Mech. and Eng.*, 1987, vol.64, pp. 567-577.

"Multisplitting of a positive definite matrix," *SIAM J. Mat. Analy. Appl.*, Jan. 1990, vol.11, no. 1, pp 69-82.

"Multisplittings with different weighting schemes," *SIAM J. Mat. Analy. Appl.*, Oct. 1989, vol. 10, no. 4, pp.481-493.

(with Plemmons) "Substructuring methods for computing the nullspace of equilibrium matrices," *SIAM J. Mat. Analy. Appl.*, Jan. 1990, vol. 11, no. 1, pp.1-22.

(with Neto) "Numerical solution of Richards' equation," *12<sup>th</sup> Brazillian Conference in Mechanical Engineering.* vol. II, Dec. 1993, pp.1013-1016.

(with Neto) "Numerical Control of the Stefan problem," *Comp. Meth. in Applied Engr. and Mech.*, 1994, vol. 113, pp. 351-362.

(with Benassi) "Parallel numerical solution of variational inequalities," *SIAM J. Num. Anal.*, June 1994, vol. 31, no. 3, pp. 813-830.

(with Neto) "Numerical Solution of Fluid Flow in Porous Media in Partially Porous Media," *ARO Report 94-1.*

"Multisplitting methods: optimal schemes for the unknowns in a given overlap," *SIAM J. Matrix Anal. and Appl.*, 2000, vol. 22, no. 2, pp. 554-568.

"Domain decomposition splittings," *LAA*, 2000, vol. 316, pp. 105-112.

"Populations with impulsive culling: control and identification," *International J. of Computer Mathematics*, (electronic pub. on Sept. 27, 2008), 2009, vol. 86, no. 12, pp. 2143-2164.

“Identification of hazards with impulsive sources,” *International J. of Computer Mathematics*, 2011, vol. 88, no. 10, pp. 762-780.

“Nonlinear least squares algorithm for identification of hazards,” *Congent Mathematics*, 2015, 2(1),  
<http://dx.doi.org/10.1080/23311835.2015.1118219>

**(d). Current Research (2015)**

1. Control of populations with impulsive culling
2. Parameter identification in diffusion-advection PDEs
3. Optimal multisplitting methods for multiprocessing computation

**(e). Textbooks:**

*An Introduction to the Finite Element Method with Applications to Nonlinear Problems*, Wiley (1985).

*Computational Mathematics: Models, Methods and Analysis with MATLAB and MPI*, CRC Press (2003).

*Elements of Matrix Modeling and Computing with MATLAB*, CRC Press (2006).

*Computational Mathematics.....second edition published in 2016.*

*Computational Linear Algebra with Applications and MATLAB Computations. CRC Press (2023).*

**Education Activities**

- (a).** Formulated the graduate concentration in computational mathematics (**CMA**).
- (b).** Served on the founding committee for the graduate interdisciplinary program in computational engineering or science (**CES**).
- (c).** Active in development of graduate courses related to scientific computation and high performance computing:
  - created and updated in 2010 MA 587 on the finite element method
  - taught MA/CSC 783 on parallel algorithms and
  - created MA/CSC 583 on introduction to parallel computing.

- (d). Active in development of undergraduate courses related to scientific computation:
- updated in 2009 MA 116 on introduction to programming with Matlab
  - created MA 132 on computational math for our life and science calculus students, uses the Excel spreadsheet to do numerical simulations,
  - created in 2009 MA 205 on elements of matrix computations, which provides “math-on-time” for students in science and engineering.
  - created in 2013 special topics course which is a follow up to MA 205 and included applications to SVD and image compression, Haar transform and introduction to wavelets, FFT used in filters and Poisson solvers, Sturm-Liouville BVP and eigenfunctions.
  - updated MA 302 which uses Matlab to do simulations for ODEs,
  - created and coordinate MA 325, an introduction to applied math with five different applied modules
  - created MA 402 on computational mathematics, which introduces numerical modeling and PDEs
  - updated in 2008/9 MA 427, 428 on numerical analysis I and II to include additional topics on systems of ODEs, CG and GMRES for large linear systems, SVD and FFT for filtering data and parallel algorithms, multicore and distributed computations.
- (e). The DOE Undergraduate Computational Engineering and Science Award in 1995 for the initial development of MA 402 on "Computational Mathematics: Models, Methods and Analysis."
- (f). Directed Ph.D. dissertations: Benassi, Jang, Mori (joint with Verghese in nuclear engineering).  
MAE-Computational Mathematics: Neto (joint with Ozisik in MAE)