

## ZACHARIAH SINKALA: VITAE

### PERSONAL DATA:

*Home Address:* 582 Sharondale Drive  
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*Work Address:* Department of Mathematical Sciences  
Middle Tennessee State University Murfreesboro, Tennessee  
37132.

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### EDUCATION:

University of South Florida, Mathematics -Ph.D.1989

University of Michigan, Ann-Arbor, Michigan -M.S 1986

University of Zambia, Mathematics -B.S.C. 1982

### EMPLOYMENT

**Professor:** Middle Tennessee State University 2001-Present

**Associate Professor:** Middle Tennessee State University 1996-2001.

**Assistant Professor:** Middle Tennessee State University 1990-1996.

**Visiting Assistant Professor:** University of Central Florida 1989-1990

### AREA OF SPECIALTY:

- Nonlinear Ordinary and Partial Differential Equations
- Nonlinear Functional Analysis
- Mathematical Biology

### PROFESSIONAL ORGANIZATION:

- Member of the American Mathematical Society
- Member of the Society for Mathematical Biology

### PUBLICATIONS:

1. *Equivalent Norms of Analytic Subspaces of  $L^p$* , (with John P. Nolan), Journal of Mathematical Analysis and Applications 126,238-249 (1987).
2. *Existence of T-Periodic Solution to Second Order:Nonlinear Systems at Resonance,'* Differential Equations:Stability and Control (Ed. Saber Elaydi), Marcel Dekker, New York, 1991.
3. *Semilinear Equations at Resonance where the Kernel has Dimension Two,'* (with R. Kent Nagle), Differential Equations: Stability and Control (Ed. Saber Elaydi), Marcel Dekker, New York, 1991.
4. *Solvability of Semilinear Abstract Equations at Resonance,* Mathematika Journal 41(1994), pp.301-311.
5. *Existence of Periodic Solutions to Boundary Value Problems for Nonlinear Systems of First Order Ordinary Differential Equations at Resonance,'* (R. Kent Nagle), in J. Nonlinear Analysis: Theory, Method and Applications vol. 25(1) 1995, pp.1-16.
6. *Existence of Solutions to Neumann problem with unbounded nonlinearity,* Communications on nonlinear Analysis Vol.1(3) July 1994, pp.79-85.

7. *Existence of solutions to periodic problem with unbounded nonlinearity*, Houston Journal of Mathematics vol. 21(4) 1995, pp.813-821.
8. *Soliton/Exciton transport in Proteins*, IMA Preprint Series 1628, June 1999.
9. *Dimension of the global attractor for wave equations with Neumann boundary conditions*, Int. J. Pure Appl. vol. 1(4), 361-372, 2002.
10. Uniqueness of positive radial solutions for  $\Delta u + f(u) = 0$  on the annulus (with Samuel Jator), *International Journal of Pure and Applied Mathematics* (2004), vol. 12(1) 23-32.
11. "If  $F(x) = \int_x^{2x} f(t) dt$  is constant, must  $f(t) = \frac{c}{t}$ ?" ( May, 2005 issue of College Mathematics Journal (MAA publications)) (Joint work with Zha, X, and He, T.X.)
12. *Soliton/Exciton Transport in Proteins*, *Journal of Theoretical Biology*, 241(2006), 919-927.
13. *Mathematical Models on the Growth of Solid Tumors*, Quantitative Medical Data analysis using Mathematical Tools and Statistical Techniques (Ed. Ying Oi), World Scientific PUB. Co. PTE LTD, Singapore 2007, 297-317.
14. A higher order B-spline Collocation Method for Linear Boundary Value Problems (with S. Jator), *Applied Mathematics and Computation*, 191(1), 2007 100-116.
15. Dynamic of prostate cancer stem cell populations with diffusion and organism response (with T. Quinn). *Biosystems* 96(2009), 69-79.

#### **INVITED PRESENTATIONS:**

1. *Solutions of abstract wave equations*, Seminar Lecture, April 2, 1996, Georgia Institute of Technology.
2. *Attractors and their Applications to Proton Transport*, Institute for Mathematics and its Applications Workshop: Mathematical Approaches for emerging and Reemerging Infectious Diseases, University of Minnesota, Minneapolis, May 4, 1999.
3. *Mathematical Models on the Growth of Solid Tumors*, Workshop on mathematical tools and statistical Techniques for Quantitative Medical Data Analysis, East Tennessee state University, Johnson City, October 13-14, 2005.
4. *Mathematical Modeling of Enzymatic Transition States*, International Conference on Computational and Mathematical Methods in Science and Engineering, Illinois Institute of Technology, Chicago, June 20-23, 2007.

#### **Reviewer for:**

1. American Mathematical Society Reviews since 2002.

#### **SUPERVISING THESIS**

- I supervised a master's thesis by Angie Murdock entitled "Kinetic of Ligand and Receptors" in 1996.
- I supervised a master's thesis by B. Seals entitled " The Dynamics of Nonlinear Systems of Ordinary Differential Equations" in 1997.

- I was a minor master's thesis advisor to the following students in Mathematics: Thomas Edward Slowey, Douglas A. Rowe, Ali Saydar Arman, Scott Noble MacDaniel, Steven Ronald Hughes, and Pascal Lynn Roubides.

## PRESENTATIONS

1. *Existence of Solutions to Boundary Value Problems for Nonlinear Ordinary Differential Equations at Resonance*, (joint work with R. Kent Nagle), Annual Meeting of the Florida Section of Mathematical Association of America, Gainesville, Florida, March 1989.
2. *Existence of  $T$ -Periodic Solution to Second Order: Nonlinear Systems at Resonance*, International Conference on Differential Equations: Theory and Application in Stability and Control, Colorado Springs, Colorado, June 1989.
3. *Semilinear Equations at Resonance where the Kernel has Dimension Two*, (presented by co-researcher, R. Kent Nagle), International Conference of Differential Equations: Theory and Applications in Stability and Control, Colorado Springs, Colorado, June 1989.
4. *Existence of Solutions to first order ordinary differential equations* at 863rd meeting, San Francisco, January 16 - 19, 1991.
5. *Existence of Solutions to nonconvex Lagrangian Systems* at the 11th annual Southeastern / Atlantic Regional Conference on Differential equations October 25 - 6, 1991 Mississippi State University.
6. *A necessary and sufficient condition of resonance for a semilinear Neumann problem* at the Midwest and Southern Atlantic second joint regional conference on Differential Equations, November 13-15, 1992 University of Kentucky.
7. *A necessary and sufficient condition of resonance for a class of second order elliptic boundary value problem*, at the Evolution Equations conference, January 7-11, 1993 Louisiana State University.
8. *Semilinear equations at resonance with unbounded nonlinearity* at the American Mathematical Society, San Antonio, January 13-16, 1993.
9. *An Alternative Computational Approach to Boundary Value for ODE*, (Joint work with Yuri Melnikov) Mississippi state Annual Conference on Differential Equations and Computational Simulation, March 19-20, 1993.
10. *Green's Functions and Numerical Attack on Eigenvalue Problems*, (Joint work with Yuri Melnikov) at the 13th annual Southeastern-Atlantic Regional Conference on Differential equations October 25-26, 1993 University of North Carolina at Wilmington.
11. *Analysis of Numerical Procedures Needed to solve Ordinary and Partial Differential Equations*, 22nd Midwest Differential Equations Conference, November 12-14, 1993 University of Missouri at Columbia.
12. *Solvability of Semilinear Abstract Equations at Resonance*, 23rd Midwest Differential Equations Conference, October 7-8, 1994 University of Oklahoma at Norman.
13. *Multiple Independent conditions for existence of periodic solutions to certain abstract wave equations* at the 13th annual Southeastern-Atlantic Regional

- Conference on Differential equations, October, 1995 North Carolina State University.
14. *Time periodic Solutions of Undamped Wave Equations*, Mississippi state Annual Conference on Differential Equations and Computational Simulation, May 16-17, 1997.
  15. *Periodic solutions on nonlinear wave equations when the ratio of the period to the length of the interval is irrational*, The 19th Annual Southern-eastern Atlantic Region Conference on Differential equations, University of Richmond, Virginia, October 22-23, 1999.
  16. *Vibron Soliton in Proteins*, Fifth Mississippi State Conference on Differential equations and Computational Simulations, Starkville, Mississippi, May, 2001.
  17. *Uniqueness of the positive radial solutions for  $\Delta u + f(u) = 0$  on the annulus*, The 23rd Annual Southerneastern Atlantic Regional Conference on Differential Equations, Kennesaw State University, Kennesaw, Georgia, October 17-18, 2003.
  18. *A Fluid Flow to study solid tumor growth*, Fluids and Waves: Recent Trends in Applied Analysis Conference, The University of Memphis, Memphis, Tennessee, May 11-13, 2006.
  19. *Simulation of Solid Tumor Growth*, A mini symposium talk at SIAM Mathematical Biology Conference, Raleigh, North Carolina, Tennessee, July 31-August 3, 2006

**Grant:** NSF Grant, 2002, "High performance Networks Connection grant" (joint proposal with Ralph Butler, Richard C. Detmer and Ngee-Sing Chong).

**MTSU Awards:**

1. *Research Grant, 1993*. Analysis of Numerical Procedures Needed to Solve Ordinary and Partial Differential Equations, MTSU Faculty Research Committee.
2. *Research Grant, 1994*, "Existence of Solutions to Neumann problem with unbounded nonlinearity" College of Basic and Applied Sciences.
3. *Research Grant, 1995*, "Existence of Solutions to Periodic Problem with Unbounded Nonlinearity". College of Basic and Applied Sciences.
4. I was awarded a Non instructional Grant to go for a sabbatical in Spring 1999, at "The institute for Mathematics and Its Application" (IMA), University of Minnesota.
5. *MTSU Collaborative Project between the Department of Mathematical Sciences and Geosciences 2003*: A Service/Research Project for Rutherford County Emergency Management Agency, MTSU Faculty Research Committee.
6. *Synergic Research Grant (joint Grant), 2007*, "Existence of Solutions to Periodic Problem with Unbounded Nonlinearity". MTSU Faculty Research Committee

**Grants not awarded:**

1. In 2003, I Submitted a Grant proposal on Interdisciplinary Research work between Department of Mathematical Sciences (MTSU) and Department

- of Biological Science (Vanderbilt University) to NSF (\$100,000). The duration of the grant is one year.
2. In 2003, I submitted a Grant proposal to USDA (\$200,000) (together with Dr. F. Michello). The duration of the grant was three years.
  3. In 2006, (Joint Submission NSF Grant Proposal \$80,000): Scientific Computing Research Environments for the Mathematical Sciences.
  4. In 2006, (Joint Submission NSF Grant Proposal \$220,360 ): The Long-Run Welfare Implications of Outward Foreign Direct Investment: Theory and Empirics
  5. In 2007, (Joint Submission NSF Grant Proposal \$91,740): Collaborative Research: Time-Stepping Schemes for Nonlinear Reaction-Diffusion Systems with Applications

**Sessions/Mini-Symposiums Co-organized:** Special Session on , Differential Equations and Dynamical Systems , AMS South Eastern meeting, Middle Tennessee State University, Murfreesboro, TN, November 3-4, 2007.

**Served on the following Committees:**

1. Graduate advisory committee.
2. Faculty search committee (Chaired twice).
3. Peer review committee.
4. MTSU Faculty Research Committee.
5. College of Basic Science Peer Review Committee
6. Library Committee

***Academic Advising:***

1. Graduate student advisor in Industrial Mathematics Program
2. Graduate student advisor in Masters Program in Mathematics.