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**Daniel B. Szyld**

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Ph.D. in Mathematics (Numerical Analysis, Olof B. Widlund, advisor), October 1983,  
Courant Institute of Mathematical Sciences, New York University.

Undergraduate studies at the School of Exact Sciences, University of Buenos Aires, 1973–  
1977.

**AREAS OF RESEARCH**

**Computational Mathematics, Numerical Analysis, and Linear Algebra:** Sparse matrix techniques. Parallel asynchronous iterations for linear and nonlinear systems. Conjugate gradient type methods. Applications to the solution of Partial Differential Equations. Domain decomposition and Schwarz methods. Applications to Markov chains and Markov processes. Nonnegative matrices and applications.

**TEACHING POSITIONS (selection)**

Department of Mathematics, Temple University, Professor (since 1995), Associate Professor (1990-1995).

Department of Computer Science, Duke University, Assistant Professor (1986–1990), Visiting Assistant Professor (1985–1986).

**AWARDS AND HONORS**

Distinguished Scholar, Department of Mathematics, Temple University, academic year 2008–2009.

Commemorative Medal of the School of Physics and Mathematics, Charles University, Prague, June 1997, for “outstanding work in Numerical Linear Algebra.”

**SELECTED RECENT GRANTS**

National Science Foundation Research Grant, Division of Mathematical Sciences, Program in Computational Mathematics, Eigenvalues problems, Krylov subspace methods, and subspace recycling, August 2011 – July 2014, \$280,000 (with Fei Xue, Co-PI).

Department of Energy Research Grant, Office of Science, Program of Advanced Scientific Computing Research, Division of Applied Mathematics, Krylov Subspace and Schwarz Methods for PDEs and Control Problems, 2008–2010, \$540,000.

National Science Foundation Research Grant, Directorate for Computer and Information Science and Engineering, Division of Computer and Communication Foundations, Program of Theoretical Foundations, Asynchronous Parallel Methods with Overlap for Google Matrices, Dynamics of Biomolecules, and Other Markov Chains Problems, 2005–2008, \$30,000.

Department of Energy Research Grant, Office of Science, Program of Advanced Scientific Computing Research, Division of Applied Mathematics, Schwarz Preconditioners for

Krylov Methods: Theory and Practice, 2005–2008, \$569,000.

National Science Foundation (NSF) Research Grant, Program in Computational Mathematics, Flexible Krylov Methods and Schwarz Preconditioners, 2002–2005, \$225,000.

#### **EDITORIAL WORK (selection)**

*Boletín SEMA* (Bulletin of the Spanish Society of Applied Mathematics), member of the Scientific Committee, 2010–present.

*Electronic Transactions on Numerical Analysis*, Editor, 1998–2004. Editor in Chief 2005–present.

*Linear Algebra and its Applications*, Associate Editor, 2011–2014.

*Mathematics of Computation*, Associate Editor, 2007–2013.

*Numerical Linear Algebra with Applications*, Member of the Editorial Board, 2008–present.

*SIAM Journal on Matrix Analysis and Applications*, Member of the Editorial Board, 2003–2014.

*Electronic Journal of Linear Algebra*, Associate Editor, 1995–2001; Advisory Editor 2001–2011.

#### **CONFERENCE ORGANIZATION (most recent, selection)**

Mid-Atlantic Numerical Analysis Day, 4 November 2011, Temple University, Philadelphia. Co-organizer.

Computer Aspects of Numerical Algorithms (CANA'10), 18–20 October 2010, Wista, Poland. Member of the Program Committee.

Sixth International Conference on the Numerical Solution of Markov Chains, 16–18 September 2010, College of William and Mary, Williamsburg, Virginia. Member of the Program Committee.

Sixth International workshop on Parallel Matrix Algorithms and Applications, 30 June–2 July 2010, Basel, Switzerland. Member of the International Program Committee.

SIAM Conference on Applied Linear Algebra, 24–28 October 2009, Monterrey, California. Member of the Organizing Committee.

Fast Algorithms for Scientific Computing: a symposium in honor of Olof B Widlund on the occasion of his seventeenth birthday, 19–20 September 2008, Courant Institute, New York University, New York. Member of the Organizing Committee.

SIAG/LA-SIMUMAT International Summer School on Numerical Linear Algebra, 21–25 July 2008, Castro Urdiales, Spain. Member of the Steering Committee.

Fifteenth Conference of the International Linear Algebra Society (ILAS), 16–20 June 2008, Cancun, Mexico. Member of the Organizing Committee.

Conference on Applied Linear Algebra in Honor of Ivo Marek, 28–30 April 2008, Novi Sad, Serbia. Member of the Scientific Committee.

Ninth IMACS International Symposium on Iterative Methods in Scientific Computing, 17–20 March, 2008, Lille, France. Member of the Scientific Committee.

“Harrachov 2007,” Computational Methods with Applications, 19–25 August 2007, Harrachov, Czech Republic. Member of the Scientific Program Committee.

Workshop on Structured Perturbations, and Distance Problems in Matrix Computations, 26–30 March 2007, Stefan Banach International Mathematical Center, Bedlewo/Poznan, Poland. Co-organizer.

Seminar on Web Information Retrieval and Linear Algebra Algorithms, 11–15 February 2007, Schloss Dagstuhl, International Conference and Research Center for Computer Science, Wadern, Germany. Co-organizer.

#### **OTHER PROFESSIONAL SERVICE (selection):**

External review panel for the Department of Mathematics, Baruch College, City University of New York, May 2000.

Member of the Board of the International Linear Algebra Society (ILAS), 2001–2004.

Chair of the SIAM Activity Group on Linear Algebra, 2007–2009.

Member of the Joint Policy Board of Mathematics Committee for the Mathematics Awareness Month 2008.

Chair of the Gene Golub SIAM Summer School Committee, 2010–2013.

External member of several doctoral committees for the Federal University of Rio de Janeiro, Brazil, the Instituto Nacional de Matemática Pura e Aplicada (IMPA), Rio de Janeiro, Brazil, the University of Wuppertal, Germany, the Technical University of Berlin, Germany, the Delft University of Technology, The Netherlands, the University of Valencia, Spain, the University of Alicante, Spain, and

#### **RESEARCH ARTICLES IN REFEREED JOURNALS (selection):**

5. Wassily Leontief, Faye Duchin and Daniel B. Szyld, New Approaches in Economic Analysis, *Science* **228** (1985) 419–422.
6. Daniel B. Szyld, Conditions for the Existence of a Balanced Growth Solution for the Leontief Dynamic Input-Output Model, *Econometrica* **53** (1985) 1411–1419.
8. Daniel B. Szyld, Criteria for Combining Inverse and Rayleigh Quotient Iteration, *SIAM Journal on Numerical Analysis*, **25** (1988) 1369–1375.
10. Ivo Marek and Daniel B. Szyld, Comparison Theorems for Weak Splittings of Bounded Operators, *Numerische Mathematik*, **58** (1990) 387–397.
16. Andreas Frommer and Daniel B. Szyld,  $H$ -splittings and Two-stage Iterative Methods, *Numerische Mathematik* **63** (1992) 345–356.

- 17 Daniel B. Szyld and Olof B. Widlund, Variational Analysis of Some Conjugate Gradient Methods, *East-West Journal of Numerical Mathematics*, **1** (1993) 51–74.
- 19 Daniel B. Szyld, Equivalence of Convergence Conditions for Iterative Methods for Singular Equations, *Numerical Linear Algebra with Applications*, **1** (1994) 151–154.
- 21 Andreas Frommer and Daniel B. Szyld, Asynchronous Two-stage Methods, *Numerische Mathematik*, **69** (1994) 141–153.
- 23 Ricardo D. Pantazis and Daniel B. Szyld, Regions of Convergence of the Rayleigh Quotient Iteration Method, *Numerical Linear Algebra with Applications*, **2** (1995) 251–269.
- 25 Mark T. Jones and Daniel B. Szyld, Two-stage Multisplitting Methods with Overlapping Blocks, *Numerical Linear Algebra with Applications*, **3** (1996) 113–124.
- 28 Michele Benzi and Daniel B. Szyld, Existence and Uniqueness of Splittings for Stationary Iterative Methods with Applications to Alternating Methods, *Numerische Mathematik*, **76** (1997) 309–321.
- 30 Daniel B. Szyld, Different Models of Parallel Asynchronous Iterations with Overlapping Blocks, *Computational and Applied Mathematics*, **17** (1998) 101–115.
- 33 Michele Benzi, Daniel B. Szyld, and Arno van Duin, Orderings for Incomplete Factorization Preconditionings of Nonsymmetric Problems, *SIAM Journal on Scientific Computing*, **20** (1999) 1652–1670.
- 34 Andreas Frommer and Daniel B. Szyld, Weighted Max Norms, Splittings, and Overlapping Additive Schwarz Iterations, *Numerische Mathematik*, **83** (1999) 259–278.
- 35 Kostas Blathras, Daniel B. Szyld, and Yuan Shi, Timing Models and Local Stopping Criteria for Asynchronous Iterative Algorithms, *Journal of Parallel and Distributed Computing*, **58** (1999) 446–465.
- 36 Andreas Frommer and Daniel B. Szyld, On Asynchronous Iterations, *Journal of Computational and Applied Mathematics* **123** (2000) 201–216.
- 40 Michele Benzi, Andreas Frommer, Reinhard Nabben, and Daniel B. Szyld, Algebraic Theory of Multiplicative Schwarz Methods, *Numerische Mathematik*, **89** (2001) 605–639.
- 41 Andreas Frommer and Daniel B. Szyld, An Algebraic Convergence Theory for Restricted Additive Schwarz Methods Using Weighted Max Norms, *SIAM Journal on Numerical Analysis* **39** (2001) 463–479.
- 43 Ludwig Elsner, Andreas Frommer, Reinhard Nabben, Hans Schneider, and Daniel B. Szyld, Conditions for strict inequality in comparisons of spectral radii of splittings of different matrices, *Linear Algebra and its Applications* **363** (2003) 65–80.

44. Ivo Marek and Daniel B. Szyld, Comparison of Convergence of General Stationary Iterative Methods for Singular Matrices, *SIAM Journal on Matrix Analysis and Applications*, **24** (2002) 68–77.
45. Valeria Simoncini and Daniel B. Szyld, Flexible Inner-Outer Krylov Subspace Methods, *SIAM Journal on Numerical Analysis* **40** (2003) 2219–2239.
47. Valeria Simoncini and Daniel B. Szyld, Theory of Inexact Krylov Subspace Methods and Applications to Scientific Computing. *SIAM Journal on Scientific Computing*, **25** (2003) 454–477.
50. Valeria Simoncini and Daniel B. Szyld, On the Occurrence of Superlinear Convergence of Exact and Inexact Krylov Subspace Methods, *SIAM Review*, **47** (2005) 247–272.
51. Valeria Simoncini and Daniel B. Szyld, The effect of non-optimal bases on the convergence of Krylov Subspace Methods, *Numerische Mathematik*, **100** (2005) 711–733.
53. Rafael Bru, Francisco Pedroche, and Daniel B. Szyld, Additive Schwarz Iterations for Markov Chains. *SIAM Journal on Matrix Analysis and Applications*, **27** (2005) 445–458.
55. Daniel B. Szyld, The many proofs of an Identity on the Norm of Oblique Projections, *Numerical Algorithms*, **42** (2006) 309–323.
56. Reinhard Nabben and Daniel B. Szyld, Schwarz iterations for symmetric positive semidefinite problems, *SIAM Journal on Matrix Analysis and Applications*, **29** (2006) 98–116.
57. Valeria Simoncini and Daniel B. Szyld, Recent computational developments in Krylov Subspace Methods for linear systems, *Numerical Linear Algebra with Applications*, **14** (2007) 1–59.
58. Marcus Sarkis and Daniel B. Szyld, Optimal Left and Right Additive Schwarz Preconditioning for Minimal Residual Methods with Euclidean and Energy Norms, *Computer Methods in Applied Mechanics and Engineering*, **196** (2007) 1612–1621.
59. David Fritzsche, Andreas Frommer, and Daniel B. Szyld, Extensions of Certain Graph-based Algorithms for Preconditioning. *SIAM Journal on Scientific Computing*, **29** (2007) 2144–2161.
61. David Fritzsche, Volker Mehrmann, Daniel B. Szyld, and Elena Virnik, An SVD approach to identifying meta-stable states of Markov chains. *Electronic Transactions on Numerical Analysis*, **29** (2008), 46–69.
62. Valeria Simoncini and Daniel B. Szyld, New conditions for non-stagnation of minimal residual methods. *Numerische Mathematik*, **109** (2008) 477–487.
64. Abed Elhashash and Daniel B. Szyld, On general matrices having the Perron-Frobenius property, *Electronic Journal on Linear Algebra*, **17** (2008) 389–413.

65. Sébastien Loisel, Reinhard Nabben, and Daniel B. Szyld, On hybrid multigrid-Schwarz algorithms, *Journal on Scientific Computing*, **36** (2008) 165–175.
66. Abed Elhashash and Daniel B. Szyld, Generalizations of  $M$ -Matrices which may not have a nonnegative inverse, *Linear Algebra and its Applications*, **249** (2008) 2435–2450.
67. Andreas Frommer, Reinhard Nabben, and Daniel B. Szyld, Convergence of Stationary Iterative Methods for Hermitian Semidefinite Linear Systems and Applications to Schwarz Methods, *SIAM Journal on Matrix Analysis and Applications*, **30** (2008) 925–938.
68. Xiuhong Du and Daniel B. Szyld, Inexact GMRES for singular linear systems, *BIT Numerical Mathematics*, **48** (2008) 511–531.
69. Abed Elhashash and Daniel B. Szyld, Two characterizations of matrices with the Perron-Frobenius property, *Numerical Linear Algebra with Applications*, **16** (2009) 863–869.
70. Abed Elhashash, Uriel G. Rothblum, and Daniel B. Szyld, Paths of matrices with the strong Perron-Frobenius property converging to a given matrix with the Perron-Frobenius property. *Electronic Journal on Linear Algebra*, **19** (2009) 90–97.
71. Sébastien Loisel and Daniel B. Szyld, On the convergence of Algebraic Optimizable Schwarz Methods with applications to elliptic problems, *Numerische Mathematik*, **114** (2010) 697–728.
72. Valeria Simoncini and Daniel B. Szyld, On the field of values of oblique projections, *Linear Algebra and its Applications*, **433** (2010) 810–818.
73. Valeria Simoncini and Daniel B. Szyld, Interpreting IDR as a Petrov-Galerkin method. *SIAM Journal on Scientific Computing*, **32** (2010) 1898–1912.
74. Abed Elhashash Daniel B. Szyld, Matrix functions preserving sets of generalized nonnegative matrices. *Electronic Journal on Linear Algebra*, **20** (2010) 673–690.
75. Daniel B. Szyld and Fei Xue, Efficient preconditioned inner solves for inexact Rayleigh quotient iteration and their connections to the single-vector Jacobi-Davidson method. *SIAM Journal on Matrix Analysis and Applications*, **32** (2011) 993–1018.

**RESEARCH ARTICLES IN REFEREED PROCEEDINGS (selection):**

94. Daniel B. Szyld, Perspectives on Asynchronous Computations for Fluid Flow Problems, in *Computational Fluid and Solid Mechanics*, K. J. Bathe, ed., Elsevier, 2001, pages 377–380.

100. Giorgos Kollias, Efstratios Gallopoulos, and Daniel B. Szyld. Asynchronous iterative computations with Web information retrieval structures: The PageRank case. In *Parallel Computing: Current and Future Issues of High-End Computing* (Proceedings of the International Conference Parco05), G.R. Joubert, W.E. Nagel, F.J. Peters, O. Plata, P. Tirado, E. Zapata, eds., John von Neumann-Institut für Computing (NIC), Jülich, Germany, NIC Series Volume 33, pp. 309–316, 2006.

## SELECTED RECENT PRESENTATIONS AT CONFERENCES

Petrov-Galerkin view of IDR (and BiCGStab), Householder Symposium XVIII on Numerical Linear Algebra, Tahoe City, California, 12–17 June 2011. Plenary speaker. Attendance by invitation only.

Algebraic Optimizable Schwarz Methods for the Solution of Banded Linear Systems and PDEs on Irregular Domains, Third International Conference on Numerical Algebra and Scientific Computing (NASC 2010) Beijing, People’s Republic of China, 23-27 October 2010. Invited plenary speaker.

Modifications to Block Jacobi with overlap to accelerate convergence of iterative methods for banded matrices, Sixteenth ILAS Conference, Pisa, Italy, 21–25 June 2010. Invited plenary speaker.

The field of values of oblique projections, Conference on Applied Linear Algebra 2010, in honor of Hans Schneider, and GAMM Workshop on Applied and Numerical Linear Algebra, Novi Sad, Serbia, 24–28 May 2010. Invited plenary speaker.

Optimal Block Method and Preconditioner for Banded Matrices SIAM Conference on Applied Linear Algebra, Monterey, California, 25–29 October 2009.

Very fast methods and preconditioners for banded matrices and PDEs on irregular domains, Third Conference of Latinamerican Mathematicians (III CLAM), Santiago, Chile, 31 August – 4 September, 2009.

Modern Krylov Subspace Methods for Parabolic Control Problems, Twentyfourth IFIP TC7 Conference on System Modelling and Optimization, Buenos Aires, Argentina, 27–31 July 2009. Invited plenary speaker.

An optimal block iterative method and preconditioner for banded matrices, Numerical Analysis and Scientific Computation with Applications (NASCA), 18–22 May 2009, Agadir, Morocco. Invited plenary speaker.

Very fast convergence of Algebraic Optimizable Schwarz methods and preconditioners, Fast Algorithms for Scientific Computing, A Symposium in Honor of Olof B. Widlund on the Occasion of His 70th Birthday, 19–20 September 2008, Courant Institute, New York University, New York.

Eventually Nonnegative and other Matrices with Perron-Frobenius Properties, Workshop on Nonnegative Matrix Theory: Generalizations and Applications, American Institute of Mathematics, Palo Alto, California, 1–5 December 2008. Attendance by invitation.

Modern Krylov Subspace Methods for Parabolic Control Problems, Conference in Nu-

merical Analysis (NumAn2008), Recent Approaches to Numerical Analysis: Theory, Methods, and Applications (honoring Richard S. Varga on his 80th birthday), 1–5 September 2008, Kalamata, Greece. Invited speaker.

Convergence of Stationary Iterative Methods for Hermitian Semidefinite Linear Systems, Fifteenth ILAS Conference, 16–20 June 2008, Cancun, Mexico.

On the convergence of Algebraic Optimizable Schwarz Methods with applications to elliptic problems, Ninth IMACS International Symposium on Iterative Methods in Scientific Computing, Lille, France, 17–20 March 2008, Invited Speaker for the minisymposium on Domain Decomposition methods.

New conditions for non-stagnation of GMRES, and corresponding convergence bounds, Eighteenth International Conference on Domain Decomposition Methods, The Hebrew University of Jerusalem, Israel, 12-17 January 2008.

Numerical Linear Algebra, APAC Summer Workshop on Computational Science, Queensland University of Technology, Brisbane, Australia, 4–8 December 2006. Invited speaker, six-hour course.

#### **SELECTED UNIVERSITY SERVICE**

Senate Committee on the Status of Women, 2002–2005. Temple University.

Promotions Committee of the College (Arts and Sciences 1996–1998, Science and Technology 1998–1999, 2009–11, chair 2010–11), Temple University.

University Tenure and Promotions Committee, Temple University, 2011–13.

Latino Initiative Committee of the Provost, Temple University, 1997–1999.

Director of Undergraduate Studies, Department of Mathematics, Temple University, 1997–1999.

Director of Graduate Studies, Department of Computer Science, Duke University, 1986–1988.

Executive Committee of the Department of Mathematics, 2003–2006, 2008–2010.

Dean Advisory Committee of the College of Science and Technology, 2007–2012.

Merit Committee, College of Science and Technology, 2008–2011.