Curriculum Vita: Joseph D. Ward

Name: Joseph D. Ward

Date of Birth: December 11, 1946

Place of Birth: Boston, Massachusetts

Marital Status: Married No. of Children: 3

Current Office Address and Telephone Number

Department of Mathematics
Texas A&M University
College Station, TX 77843

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1902 Bee Creek
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Citizenship

U.S.

In The Profession

1985-present	Professor of Mathematics, Texas A&M University College Station, Texas 77843-3368
1980-1985	Associate Professor of Mathematics, Texas A&M University, College Station, Texas 77843-3368
1974-1980	Assistant Professor of Mathematics, Texas A&M University, College Station, Texas 77843-3368
1973-1974	Instructor of Mathematics, Purdue University, West Lafayette, Indiana 47907

Education

DEGREE	MAJOR	UNIVERSITY	YEAR
Ph.D.	Mathematics	Purdue University	1973
M.S.	Mathematics	Purdue University	1970
A.B.	Mathematics	Boston College	1968

Society Memberships

AMS, American Mathematical Society
MAA, Mathematical Association of America

Service Activities

University

Editorial Board: Approximation Theory and Applications, 1990-present
Editorial Board: Journal of Mathematical Analysis and Applications, 1996-1999
Editorial Board: Mathematics of Computation, 1996-2004
Editorial Board: Advances in Computational Mathematics, Appointment in 2000
Editorial Board: J. Approximation Theory, Appointment in Nov. 2004
Co-organized (together with F. Narcowich) a Special Issue for AiCM: Approximation and Computation on the Sphere.
Co-edited (with F. Narcowich) Volume 21, issues 1 & 2, of Adv. Comput. Math. (2004). This was devoted to computation and approximation on the sphere.

Departmental

Social Committee, Head 1975
Engineering Math Committee, Head 1975
Centennial Committee, 1975
Numerical Analysis Committee – Head, 1977-1978
Long Range Planning Committee – Member, 1983-1984
Committee for Promotion and Tenure – Chairman, 1993
Executive Committee, 1994-1995, 1997-1998, 2008-2010
Committee P, 1995-1996, 1999-2001
Committee T, 2004-2006, Head, 2005
Departmental Service Award, 2005
Graduate Committee, 1999-2001, 2004-2006
Committees to evaluate and review progress of junior analysts – Member, 1981-1984
Wrote graduate qualifiers for M641-642 (together with R. Smith and J. Zhou), Spring and Fall, 2002, 2003, 2004. Wrote graduate qualifiers for both the Applied and Combined Applied/Numerical, Fall 2008.

Reviewing and Refereeing

SIAM J. Math. Anal.
Math. Comp.
Constr. Approx.
Adv. in Comp. Math.
Proc. of AMS
Linear Alg. and Appl.
Neural Networks

Numerous Conference Proceedings
Annals of Mathematics
NSF

Research Grants and Contracts

A. Current

NSF: DMS–0807033 (joint with F.J. Narcowich), Aug. 1, 2008-July 31, 2011, $224,900.

B. Past

1. NSF: DMS-0708470, (PI: G. Petrova, co-PI with B. Popov, F.J. Narcowich, and J. Zinn), "Approximation and Learning in High Dimensions" (conference), July 1, 2007-June 30, 2008, $15,000.
2. NSF: DMS-0504353, (co-PI with F.J. Narcowich), August 1, 2005-July 31, 2008, $204,697.
3. NSF: DMS-0204449, (co-PI with F.J. Narcowich), August 1, 2002-July 31, 2005, $208,184.
4. NSF: DMS-9971276, July 1, 1999-June 30, 2002, $87,179.
5. AFOSR: F49620-98-1-0204DEF, (co-PI with F. Narcowich), 1998-2000, $93,133 plus one year renewal to 2001.
6. AFOSR: F49620-95-1-0194DEF, (co-PI with F. Narcowich), 1995-1998, $135,429.
7. NSF: DMS-9505460, (co-PI with C.K. Chui), 1995-1997, $150,000.
8. NATO: #CR-900158 (co-PI with C.K. Chui), University of Duisburg, 1993-1994.
9. NSF: DMS-9206928 (co-PI with C.K. Chui), 1992-1994, $225,000.
10. AFOSR: #F49620-92-J-0403DEF (co-PI with F. Narcowich), 1992-1994, $61,000.
11. NSF: DMS-8901345 (co-PI with C.K. Chui), 1989-1991.
12. NSF: (co-PI with C.K.Chui and L.L. Schumaker), 1986-1988.

Invited Addresses

1. Presented a 1 hour invited talk, "Best Approximation by Compact Operators on Hilbert Space," Illinois, Indiana, Purdue functional analysis seminar held at Wabash College, Indiana, February 1974.

2. Presented a 20 min. invited talk, "Compact Perturbations of Operators," Annual Texas Section of the Mathematical Association of America, Texas A&M University, April 2, 1976.

3. Invited guest of SFB 72, Institute fur Angewandte, Mathematik und Informatik der Universitat Bonn, September 20, 1976-December 20, 1976.

4. Presented a 1 hour colloquium talk, "Applications of M-ideal Theory to Approximation Theory and Operator Theory," University of Bonn.

5. Presented a 1 hour colloquium talk, "Applications of M-ideal Theory to Approximation Theory and Operator Theory," University of Hagen.

6. Presented a 1 hour colloquium talk, "Applications of M-ideal Theory to Ideal Theory and Lifting Problems," University of Arkansas, November 17, 1977.

7. Presented a 20 min. talk, Regional AMS Meeting on Approximation Theory, Houston, TX, April 7-8, 1978.

8. Presented a 1 hour colloquium talk, "Monotone Approximation by Splines," Stephen F. Austin State University, October 31, 1978.

9. Presented a 25 min. talk, Special Session on Operator Theory (organizer: Carl Pearcy), AMS Meeting, Cincinnati, OH, January 1982.

10. Presented a 1 hour talk, "Some Results on Constrained Approximation," 5th International Conference on Approximation Theory, Texas A&M University, January 1986.

11. AMS Regional Meeting, Southwest Missouri, March 1991 (invited but did not attend).

12. AMS Regional Meeting, Tampa, FL, March 1990 (invited but did not attend).

13. Presented a 1 hour talk, Radial Basis Workshop at Cambridge University, July 1991.

14. Presented a 1 hour talk, IBM, Yorktown Heights, October 1991.

15. Presented a 1 hour talk, IBM, December 1992.

16. Presented a half hour talk, CBMS Lecture – C.A. Micchelli, Kent State, December 1990.

17. Presented a 1 hour talk, de Boor–DeVore Approximation Session, Oberwolfach, Germany, August 1993.

18. Invited 1 hour talk, International Workshop on Wavelets, University of Montreal, February 1996.

19. Half-hour invited talk, International Conference on Curves and Surfaces, Chamonix, France, June 1996.

20. Invited 1 hour talk, University of Hohenheim (Stuttgart), May 21, 1997 (local expenses paid).

21. Invited half-hour talk, Special Session on Linear Programming in Approximation and Algorithms, Informs, San Diego, CA, May 6, 1997.

22. Invited 1 hour talk, NSF-China Conference on Applied Mathematics, Guanzhou, China, August 1997 (all expenses paid, unable to attend).

23. Invited 1 hour talk, CAGD and Wavelet Methods for Reconstructing Functions, Montecatini, Italy, June 1998 (all expenses paid).

24. Invited half-hour talk, International Workshop in Approximation Theory, Eilat, Israel, September 1998 (80% expenses paid).

25. Invited 1 hour talk, International Conference in Approximation Theory, Dortmund, Germany, Sept.-Oct. 1998 (all expenses paid).

26. Invited 1 hour talk, International Conference on Wavelet Analysis and its Applications, Guangzhou, China, November 15-19, 1999 (local expenses paid).

27. Invited CBMS Lecture Series on Wavelets (David Donoho), University of Missouri (St. Louis), May 2000 (all expenses paid).

28. Colloquium 1 hour talk, Texas Tech University, Lubbock, Texas, April 2000 (all expenses paid).

29. Colloquium 1 hour talk, University of Georgia, Athens, GA, November 2000 (all expenses paid).

30. Presented a half-hour invited talk, "Scattered-Data Interpolation on R^N: Error Estimates for Radial Basis and Band-Limited Functions," Workshop on Approximation Theory (within framework of FoCM Conference, organizers: A. Pinkus and A. Ron), Minneapolis, MN, August 10-12.

31. Invited 1 hour colloquium talk, "Approximation Power of RBFs and their Associated SBFs: A Connection," Gottingen University, Germany, July 12, 2004 (this was part of a 2-week stay at Gottingen, H. Wendland and R. Schaback (hosts) which was completely paid for by the host institution).

32. Presented a 1 hour invited talk, "Norming Sets in Multivariate Approximation: An Overview," Sixth International Conference on Multivariate Approximation, Dortmund, Germany, Sept. 25-Oct. 1, 2005 (Funding: conference organizers).

33. Invited Plenary 1 hour talk, "Direct and Inverse Theorems for RBF-Type Functions: Implications and Applications," 12 International Conference on Approximation Theory, San Antonio, TX, March 4-8, 2007 (Funding: conference organizers).

34. Invited 1 hour colloquium talk, "Approximation Power of RBFs and their Associated SBFs: A Connection," Germany, July 13, 2007. (This was part of a 2-week stay at Gottingen [Hosts: H. Wendland and R. Schaback] which was completely paid for by the host institution.)

35. Invited 1 hour talk, "Bernstein Theorems for SBFs on the n-Sphere," Technische Universitat Munchen, Germany, July 12, 2007. (This was part of a 1-week stay in Munich [Host: Wolfgang zu Castell], local expenses were paid for by the host institution.)

Other Addresses and Recognition

1. Presented a 15 min. talk, "Best Approximation by Compact Operators (contributed)," Regional Conference on Theory of Best Approximation and Functional Analysis (sponsored by NSF and Kent State University), June 11-15, 1973.

2. Presented a 10 min. talk, "Limits of $H^{k,p}$ spline at $p \rightarrow 1$ (contributed)," Winter Meeting of the AMS, Washington, DC, January, 1975.

3. Presented a 20 min. talk, "Operator Approximation with Restricted Spectra (contributed)," NSF sponsored Regional Conference on Operatory Theory, Bucknell University, August 11-15, 1975 (supported by outside funding).

4. Attended the Regional Conference on Numerical Solution of Two-Point Boundary-Value Problems, Texas Tech University, July 3-8, 1975 (outside funding was provided).

5. Presented a 10 min. talk, "The Smoothness of Best L_2 Spline Approximation," Winter Meeting of the AMS, San Antonio, TX, January 1974.

6. Presented a 20 min. talk, "Approximation by M-ideals in the Disc Algebra," International Conference on Approximation Theory, Austin, TX, 1980.

7. Presented a 20 min. talk, "A Generalized Toeplitz–Hausdorff Theorem," GPOT (Great Plains Operator Theory), University of Kansas, May 1981.

8. Presented a half hour talk, Approximation Meeting, Chamonix, France, June 1990.

9. Presented a talk, Winter AMS Special Session on Wavelets (organizer: G. Strang), Cincinnati, OH, January 1994.

10. Presented a talk, Special Session on Multivariate Approximation Theory-Canadian Math. Society, Edmonton, Canada, June 1994 (funding: U. of Alberta).

11. Presented a talk, Summer Meeting on Mathematical Programming, Ann Arbor, MI, August 1994.

12. Presented a half-hour talk (joint with F.J. Narcowich and P.W. Smith), "Density of Translates of Radial Functions on Compact Sets," Eighth International Conference on Approximation Theory, College Station, TX, January 8-12, 1995.

13. Presented a half-hour talk (joint with F.J. Narcowich), "Nonstationary Spherical Wavelets for Scattered Data," Eighth International Conference on Approximation Theory, College Station, TX, January 8-12, 1995.

14. Presented a half-hour talk (joint with F.J. Narcowich), "Wavelets Associated with Periodic Basis Functions," Eighth International Conference on Approximation Theory, College Station, TX, January 8-12, 1995.

15. Presented a talk, International Conference on Scattered Data Fitting, Cancun, Mexico, March 1995.

16. Presented a talk, Session on Geodesy and Approximation Theory, Oberwolfach (organizer: W. Freeden), October 1995.

17. Presented a15 min. talk, Vanderbilt University, Nashville, TN, May 2000.

18. Research in Pairs (together with F.J. Narcowich and R. Schaback), Oberwolfach, Germany, Aug. 6-19, 2000 (local expenses paid).

19. Presented a 1 hour talk, "Least Squares Approximation by Radial Basis Functions," Conference on Advances in Constructive Approximation, Nashville, TN, May 14-17, (funding: conference organizers).

20. Presented a talk, "Error Estimates for Interpolation of Rough Data by Smooth Functions," 2001 AMS Southeastern Sectional Meeting, University of Tennessee, Chattanooga, TN, Oct. 5-6, 2001, Special Session: Sphere-Related Approximation and Applications (organizers: L.L. Schumaker and E. Saff).

21. Presented a 1 hour talk, "Interpolation and Least Squares Approximation by Radial Basis Functions," Oberwolfach Workshop on Geomathematik, May 23-29, 2004 (organizers: W. Freeden, Eric W. Grafarend, Ian H. Sloan, and Leif Svensson, funding by Oberwolfach, NSF and TAMU Math. Dept.).

22. Presented a 20 min. talk, "Approximation Power of RBFs and their Associated SBFs: A Connection" (a contributed talk given on May 20, 2004), 11th International Conference in Approximation Theory, Gatlinburg, TN, May 18-24, 2004.

23. Presented a 1 hour talk, "Interpolation and Least Squares Approximation by Radial Basis Functions," Oberwolfach Workshop on Geomathematik, May 23-29, 2004, (organizers: W. Freeden, Eric W. Grafarend, Ian H. Sloan, and Leif Svensson, funding by Oberwolfach, NSF and TAMU Math. Dept.).

24. Presented a half hour talk, "Sobolev Error Estimates for Scattered Data Interpolation on S^N," Conference on Interaction Between Wavelets and Splines, Athens, GA, May 16-19, 2005.

25. Presented a half hour talk, "A Discussion of Preconditioners for Radial Basis Functions," SIAM Conference on Geometric Design and Computing, Phoenix, AR, Oct. 31-Nov. 3, 2005.

26. Presented a half hour talk, "Sobolev Error Estimates for Scattered Data Interpolation on S^N" (joint with F.J. Narcowich), Robert Schaback Birthday Conference, Goettingen, Germany, Nov. 26, 2005.

27. Presented a half hour talk, "A Primer on Least Squares Approximation with RBFs," Sixth International Conference on Curves and Surfaces, Avignon, France, June 29-July 5, 2006.

28. Presented a 1 hour talk, "Interpolation of Scattered Data on Spheres using SBFs: Direct and Inverse Error Estimates and a Bernstein Inequality," Dept. of Mathematics, Sam Houston State University, Oct. 12, 2006.

29. Presented a 1 hour talk, "Approximation with Interpolatory Constraints," Texas A&M University at Prairie View, Nov. 9, 2007 (funding: local expenses paid by Prairie View).

30. Presented a 1 hour talk, "Norming Sets in Multivariate Approximation: An Overview," Constructive Function Theory, Sam Houston State Univ., Oct. 26-27, 2007 (funding: Local expenses paid by Sam Houston State Univ.).

31. Presented a half-hour talk, "Bernstein Theorems for SBFs on the n-Sphere," Special Session on Approximation on the Sphere, ICIAM, Zurich, Switzerland, July 16-20, 2007.

32. Presented a half-hour talk, "Surface Divergence-Free RBF Interpolants on Spheres," 7th International Conference on Multivariate Approximation, Haus Bommerholz, Dortmund, Germany, Sept. 22-26, 2008.

33. Presented a half-hour talk, "Surface Divergence-Free RBF Interpolants on Spheres," Constructive Function Theory, Sam Houston State Univ., Oct. 24-25, 2008.

34. Presented a half-hour talk, "L_p Approximation and Interpolation by SBFs on S^d," Biennial Conference on Numerical Analysis, Glasgow Scotland, June 23-26, 2009.

35. Presented a 1 hour talk, "L_p Approximation and Interpolation by SBFs on S^d," City University of Hong Kong, Hong Kong, January 11, 2010 (funding: partially funded by city University; partially funded by my NSF grant).

Other

1. Co-edited (together with C.K. Chui and L.L. Schumaker) The Proceedings of the Fourth International Conference on Approximation Theory (College Station, 1983). These proceedings were published by Academic Press.

2. Reviewed (together with C.K. Chui) the book **Optimization and Approximation** (by W. Krabs). This review appeared in the Bulletin of the AMS, Vol. 3 (#31), November, 1980.

3. I have reviewed 3 NSF proposals in the last 2 years.

4. I have refereed for several journals including the Indiana Math J., Illinois M. J., PAMS, Pacific Math J., Transactions of AMS.

5. I recently proof-read a book "Geometric Functional Analysis and its Applications" by Professor R.B. Holmes which appeared in the Springer-Verlag Graduate Texts series.

6. Charles Chui, Philip Smith and myself organized the First Annual Conference on Numerical Analysis and Approximation Theory. This was a one day conference with speakers from Rice, U.T., TAMU and U.H.

7. Conferences Co-organized: "Approximation and Learning in High Dimensions," (with Ron DeVore, Vladimir Koltchinskii, Francis Narcowich, Bojan Popov, Steve Smale, Joe Ward, Joel Zinn), October 19-21, 2007.

Publications

Papers Published or Accepted

1. J.D. Ward, Chebyshev centers in spaces of continuous functions, *Pacific J. Math.* **52** (1974), no. 1, 283–287.

2. R.B. Holmes and J.D. Ward, An approximative property of spaces of continuous functions, *Glasgow Math. J.* **15** (1974), 48–53.

3. R.B. Holmes, B.E. Scranton, and J.D. Ward, Best approximation by compact operators, II, *Bull. Amer. Math. Soc.* **80** (1974), 98–102.

4. P.W. Smith and J.D. Ward, Restricted centers in subalgebras of $C(X)$, *J. Approx. Theory* **15** (1974), no. 1, 54–59.

5. C.K. Chui, P.W. Smith, and J.D. Ward, Limits of $H^{k,p-}$ splines, *Bull. Amer. Math. Soc.* **81** (1975), no. 3, 536–565.

6. C.K. Chui, P.W. Smith, and J.D. Ward, Approximation with restricted spectra, *Math. Z.* **144** (1975), 289–297.

7. R.B. Holmes, B.E. Scranton, and J.D. Ward, Uniqueness of commuting compact approximations, *Trans. Amer. Math. Soc.* **208** (1975), 330–334.

8. R.B. Holmes, B.E. Scranton, and J.D. Ward, Approximation from the space of compact operators and other M-ideals, *Duke Math. J.* **42** (1975), no. 2, 259–269.

9. D.A. Legg, B.E. Scranton, and J.D. Ward, Chebyshev subspaces in the space of compact operators, *J. Approx. Theory* **15** (1975), no. 4, 326–334.

10. D.A. Legg and J.D. Ward, A generalized magic square, *Amer. Math. Monthly* **82** (1975), no. 9, 925–926.

11. P.W. Smith and J.D. Ward, Restricted centers in $C(\Omega)$, *Proc. Amer. Math. Soc.* **48** (1975), no. 1, 165–172.

12. C.K. Chui, E.R. Rozema, P.W. Smith, and J.D. Ward, Simultaneous spline approximation and interpolation preserving norms, *Proc. Amer. Math. Soc.* **54** (1976), 98–100.

13. C.K. Chui, E.R. Rozema, P.W. Smith, and J.D. Ward, Metric curvature, folding, and unique best approximation, *SIAM J. Math. Anal.* **7** (1976), 436–449.

14. C.K. Chui, P.W. Smith, and J.D. Ward, Preferred NBV-splines, *J. Math. Anal. Appl.* **55** (1976), no. 1, 18–31.

15. C.K. Chui, P.W. Smith, and J.D. Ward, On uniqueness in piece-wise polynomial approximation, *Proc. 21st Conference of Army Mathematicians*, San Antonio, Texas.

16. C.K. Chui, P.W. Smith, and J.D. Ward, Favard's solution is the limit of W^{k,p^-} splines, *Trans. AMS* **220** (1976), 299–305.

17. C.K. Chui, P.W. Smith, and J.D. Ward, Quasi-uniqueness in L^∞ extremal problems, *J. Approx. Theory* **18** (1976), no. 3, 213–219.

18. C.K. Chui, P.W. Smith, and J.D. Ward, On the range of certain locally determined spline projections, *Proc. Conference of Approximation Theory at Bonn*, Springer-Verlag, 1976.

19. C.K. Chui, P.W. Smith, and J.D. Ward, A note on Riesz operators, *Proc. Amer. Math. Soc/* **60** (1976), 92–94.

20. D.L. Barrow, C.K. Chui, P.W. Smith, and J.D. Ward, Unicity of best L_2 approximation by second order splines with variable knots, *Bull. AMS* **83** (1977), 1049–1050.

21. C.K. Chui, D.A. Legg, P.W. Smith, and J.D. Ward, On a question of Olsen concerning compact perturbations of operators, *Michigan Math. J.* **24** (1977), 119–127.

22. C.K. Chui, P.W. Smith, and J.D. Ward, On the smoothness of best L^p approximants from nonlinear spline manifolds, *Math. Comp.* **31** (1977), 14–23.

23. C.K. Chui, P.W. Smith, and J.D. Ward, L-ideals and numerical range preservation, *Illinois J. Math.* **21** (1977), 365–373.

24. D.A. Legg and J.D. Ward, Essentially Hermitian operators on ${}^\ell 1$, are compact perturbations of Hermitians, *Proc. AMS* **67** (1977), 224–226.

25. D. Barrow, C.K. Chui, P.W. Smith, and J.D. Ward, Unicity of best mean approximation by second order splines with variable knots, *Math Comp.* **32** (1978), 1131–1143.

26. C.K. Chui, P.W. Smith, and J.D. Ward, Best L_2 local approximation, *Approx. Theory* **22** (1978), 254–261.

27. R.R. Smith and J.D. Ward, M-ideal structures in Banach algebras, *J. Funct. Anal.* **27** (1978), 337–349.

28. C.K. Chui, P.W. Smith, and J.D. Ward, Best L_2 approximation from nonlinear spline manifolds II - application to optimal quadrature formula, *Proc. 977 Army Numerical Analysis and Computers Conference.*

29. C.K. Chui, P.W. Smith, and J.D. Ward, Comparison of digital filters which produce derivative approximations, *Proc. 1978 Army Numerical Analysis Conference.*

30. J. Mach and J.D. Ward, Approximation by compact operators on certain Banach spaces, *J. Approx. Theory* **23** (1978), 274–286.

31. G.D. Allen and J.D. Ward, Hermitian lifting in $B(lp)$, *J. Operator Theory* **1** (1979), 27–36.

32. G.D. Allen and J.D. Ward, A simultaneous lifting theorem for block diagonal operators, *Trans. Amer. Math. Soc.* **250** (1979), 385–397.

33. C.K. Chui, P.W. Smith, and J.D. Ward, Approximation by minimum norm interpolants in the disc algebra, *J. Approx. Theory* **27** (1979), 291–295.

34. C.K. Chui, P.W. Smith, and J.D. Ward, Monotone approximation by spline functions, *Proc. Conference of Approximation Theory at Bonn*, Springer-Verlag, Summer 1979.

35. R.R. Smith and J.D. Ward, M-ideals in $B(lp)$, *Pacific J. Math.* **81** (1979), 227–237.

36. R.R. Smith and J.D. Ward, Applications of convexity and M-ideal theory to quotient Banach algebras, *Quart. J. Math. (Oxford)*, **30** (1979), 365–384.

37. G.D. Allen, D.A. Legg, and J.D. Ward, Hermitian liftings in orlicz sequence spaces, *Pacific J. Math.* **86** (1980), 379–387.

38. G.D. Allen, D.A. Legg, and J.D. Ward, Essentially Hermitian operators in $B(L_p)$, *Proc. AMS* **80** (1980), 71–77.

39. C.K. Chui, P.W. Smith, and J.D. Ward, Degree of L_p approximation by monotone splines, *SIAM J. Anal.* **11** (1980), 436–447.

40. C.K. Chui, P.W. Smith, and J.D. Ward, Approximation by M-ideals in the disc algebra, *Proc. International Conference on Approximation Theory*, Austin, 1980.

41. R.R. Smith and J.D. Ward, Matrix ranges for Hilbert space operators, *Amer. J. Math.* **102** (1980), 1031–1081

42. R.R. Smith and J.D. Ward, Locally isometric liftings from quotient C^*-algebras, *Duke Math. J.* **47** (1980), 621–631.

43. F.J. Narcowich and J.D. Ward, A Toeplitz–Hausdorff theorem for matrix ranges, *J. Operator Theory* **6** (1981), 87–101.

44. D.D. Rogers and J.D. Ward, C_p-minimal positive approximants, *Acta Math. Szeged* **43** (1981), 109–115.

45. R.R. Smith and J.D. Ward, The geometric structure of generalized state spaces, *J. Func. Anal.* **40** (1981), 170–184.

46. C.K. Chui, P.W. Smith, and J.D. Ward, Cholesky factorization of positive definite bi-infinite matrices, *J. Numer. Funct. Anal. Optim.* **5** (1982), 1–20.

47. F.J. Narcowich and J.D. Ward, Support functions for matrix ranges: Analogues of Lumer's formula, *J. Operator Theory* **7** (1982), 25–49.

48. F.J. Narcowich and J.D. Ward, A characterization of essential matrix ranges, *Bull. London Math. Soc.* **14** (1982), 107–111.

49. P.W. Smith and J.D. Ward, Compression and factorization of diagonally dominant matrices, *Proc. Conference on Approx. Theory*, Edmonton, Canada, 1982.

50. R.R. Smith and J.D. Ward, A note on polynomial operator approximation, *Proc. AMS* **88** (1983), 491–494.

51. F.J. Narcowich and J.D. Ward, Toeplitz-Hausdorff systems, *Linear Algebra Appl.* **62** (1984), 183–193.

52. K.T. Andrews and J.D. Ward, Factorization of diagonally dominant operators on $L_1([0,1)], x)$, *Trans. AMS* **291** (1985), 789–800.

53. D.A. Legg, F.J. Narcowich, and J.D. Ward, Best approximation from stepped subspaces, *J. Approx. Theory Appl.* **1** (1985), 29–49.

54. C.A. Micchelli, P.W. Smith, J. Swetits, and J.D. Ward, Constrained L_p approximation, *Constr. Approx.* **1** (1985), 93–102.

55. P.W. Smith and J.D. Ward, Factorization of diagonally dominant operators on ${}^{\ell}1$, *Illinois J. Math.* **29** (1985), 370–381.

56. D.A. Legg and J.D. Ward, Limits of operator approximants, *Proc. AMS*, to appear.

57. K.T. Andrews and J.D. Ward, *LU*-factorization of order bounded operators on Banach sequence spaces, *J. Approx. Theory* **48** (1986), 169–180.

58. K.T. Andrews, P.W. Smith, and J.D. Ward, *LU*-factorization of operators in ${}^{\ell}1$, *Proc. AMS* **98** (1986), 247–252.

59. J.D. Ward, Some constrained approximation problems, *Proc. International Conference in Approximation Theory, (College Station, TX, 1986)*, Academic Press, New York, 1986, pp. 211–229.

60. K.T. Andrews and J.D. Ward, Proximinality in operator algebras on L_1, *J. Operator Theory* **17** (1987), 213–221.

61. C.K. Chui, K. Jetter, and J.D. Ward, Cardinal interpolation by Multivariate Splines, *Math. Comp.* **48** (1987), 711–724.

62. P.W. Smith and J.D. Ward, Distinguished solutions to a constrained minimization problem, *Approx. Theory Appl.* **4** (1988), 29–40.

63. W.F. Moss, P.W. Smith, and J.D. Ward, Nonlinear eigenvalue approximation, *Numer. Math.* **52** (1988), 365–375.

64. V.I. Paulsen, S.C. Power, and J.D. Ward, Semi-discreteness and dilation theory for nest algebras, *J. Funct. Anal.* **80** (1988), 76–87.

65. S.K. Tsui and J.D. Ward, Interpolation of states by vector states on certain operator algebras, *Integral Equations Operator Theory* **11** (1988), 258–266.

66. G.D. Allen, D.R. Larson, G. Woodward, and J.D. Ward, Similarity of nests in L_1, *J. Funct. Anal.* **92** (1990), 49–76.

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68. P.W. Smith and J.D. Ward, Quasi-interpolants from spline interpolation operators, *Constr. Approx.* **6** (1990), 97–110.

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Other Writings

1. *Polynomial Reproducing Formulas and the Commutator of a Locally Spline Topics in Multivariate Approximation*, Academic Press, 1987, pp. 255–264.

Books

1. *Approximation Theory IV*, with C.K. Chui and L.L. Schumaker (eds.), Academic Press, New York, 1983.

2. *Approximation Theory V*, with C.K. Chui and L.L. Schumaker (eds.), Academic Press, New York, 1986.

3. *Approximation Theory IV*, (2 volumes), with C.K. Chui and L.L. Schumaker (eds.), Academic Press, 1989.

Current and Projected Research

My research interests are currently two-fold:

(1) Approximation Theory Algebras

(2) Operator Theory and Operator Algebras

Currently I'm looking at outgrowths connected to papers 51-55 in my bibliography.

Teaching

M121	Fall 1974
M417	Fall 1974
M122	Spring 1975
M639	Spring 1975
M652	Spring 1976
M307	Spring 1976
M651	Fall 1976
M210	Fall 1976
M307	Spring 1977 – 2 courses
M308	Spring 1977
M307	Fall 1977
M651	Fall 1977
M222-501 (30 students)	Spring 2002
M642-600 (6 students)	Spring 2002

M657-100 (11 students)	Summer 2002
M668-600 (7 students)	Fall 2002
M414 (25 students)	Spring 2003
M423 (25 students)	Spring 2003
M601 (30 students)	Summer 2003
M641 (11 students)	Fall 2003
M251 (56 students)	Spring 2004
M642 (8 students)	Spring 2004
M311 (29 students)	Summer 2004
M658 (5 students)	Fall 2004
M308-512 (50 students)	Spring 2005
M308-513 (50 students)	Spring 2005
M640 (17 students)	Fall 2005
M308 (50 students)	Spring 2006
M409 (20 students)	Spring 2006
M658 (5 students)	Fall 2006
M304-501	Spring 2007
M304-502	Spring 2007
M407-501	Fall 2007
M414-502	Spring 2008
M172-502	Spring 2008
M641-600	Fall 2008
M414-502	Spring 2009
M642-600	Spring 2009
M412	Fall 2009

Graduate Students Supervised

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Quoc Le Giah (co-chair with F.J. Narcowich)
Ed Fusilier (co-advisor with F.J. Narcowich)
John Paul Ward (co-advisor with F.J. Narcowich)

Ph.D. Committees:
Z. Zhang (D. Larson's student)
R. Eubank (Stat.)