Curriculum Vitæ

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Ph.D., Mathematics, Rice University, 1968
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Professional Experience:

Professor, University of Chicago, 1975-present
Chairman, Department of Computer Science, University of Chicago, 1994-1997
Associate Professor, University of Chicago, 1972-1975
Assistant Professor, University of Chicago, 1969-1972
Instructor, University of Chicago, 1968-1969
Mathematician, Esso Production Research Co., 1967-1968

Other Professional Activities:

Assoc. editor SIAM J. Numer. Anal 1/76 - 1/86
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Publications:

On the existence of an iterative method for the solution of elliptic difference equations with an improved work estimate, Proceedings of C. I. M. E. Conference on Numerical Solution of Partial Differential Equations, July, 1967, 175-192.

An approximate factorization procedure for solving self-adjoint elliptic difference equations, with R. P. Kendall and H. H. Rachford, SIAM J. Numer. Anal. **5** (1968), 559-573.

A factorization procedure for the solution of elliptic difference equations, SIAM J. Numer. Anal. **5** (1968) 753-782.

Factorization techniques for elliptic difference equations, with H. H. Rachford and H. L. Stone, Proceedings Amer. Math. Soc. Symposium on field problems in continuum physics, April 1968, 168-174.

The numerical solution of waterflooding problems in petroleum engineering by variational methods, with J. Douglas, Proceedings SIAM Symposium on nonlinear problems, January 1969, 53-63.

Application of variational methods to waterflooding problems, with J. Douglas and H. H. Rachford, Jour. of Canadian Petroleum Tech. **8** (1969), 79-85.

Galerkin methods for parabolic equations, with J. Douglas, SIAM Numer. Anal.**7** (1970), 575-626.

Uniqueness and comparison theorems for nonlinear elliptic equations in divergence form, with J. Douglas and J. Serrin, Archive for Rational Mechanics and Analysis **42** (1971), 157-168.

Alternating-direction Galerkin methods on rectangles, with J. Douglas, Numerical Solution of Partial Differential Equations - II (B. Hubbard, ed.), 133-214, Academic Press, New York, 1971.

Projection methods for Dirichlet's problem in approximating polygonal domains with boundary-value corrections, with J. Bramble and V. Thomee, Math. Comp. **26** (1972) 869-879.

A finite element collocation method for the heat equation, with J. Douglas, Symposia Mathematica **10** (1972), 403-410, Academic Press.

Some L^2 error estimates for parabolic Galerkin methods, The Mathematical foundations of the Finite Element Method with Applications to Partial Differential Equations, (A. K. Aziz, ed.) 491-504, Academic Press, 1972.

A fourth-order-correct projection procedure for Dirichlet's problem on approximating domains, Seminaire d'Analyse Numerique 1971-1972, Universite de Paris-Sud -Centre d'Orsay, U. E. R. de Mathematiques, 1972.

Numerical solutions of the one-dimensional primitive equations using Galerkin approximations with localized basis functions, with J. Douglas, H. Wang, and P. Halpern, Mon. Wea. Rev. **100** (1972), 738-746.

Some superconvergence results for Galerkin methods for two-point boundary problems, with J. Douglas, Topics in Numerical Analysis (J. J. H. Miller, ed.), 89-92, Academic Press, 1973.

Galerkin methods for parabolic equations with nonlinear boundary conditions, with J. Douglas, Num. Math. **20** (1973), 213-237.

A finite element collocation method for quasilinear parabolic equations, with J. Douglas, Math. Comp. 27 (1973) 17-28.

Superconvergence for Galerkin methods for the two point boundary value problem via local projections, with J. Douglas, Num. Math. **21** (1973), 270-278.

Galerkin methods for first order hyperbolics: an example, SIAM J. Num. Anal. **10** (1973), 890-899.

L^2-estimates for Galerkin methods for second order hyperbolic equations, SIAM J. Num. Anal. **10** (1973), 880-889.

Collocation Methods for Parabolic Equations in a Single Space Variable, with J. Douglas, Lecture Notes in Mathematics 385, Springer-Verlag, 1974.

Galerkin approximations for the two point boundary problem using continuous, piecewise polynomial spaces, with J. Douglas, Num. Math. **2** (1974), 99-109.

A Galerkin procedure for approximating the flux on the boundary for elliptic and parabolic boundary value problems, with J. Douglas and M. F. Wheeler, RAIRO, **8** (1974), 47-59.

Some superconvergence results for an H^1-Galerkin procedure for the heat equation, with J. Douglas and M. F. Wheeler, Lecture Notes in Computer Science, **10**, Springer-Verlag, 1974.

L^2 error estimates for projection methods for parabolic equations in approximating domains, Mathematical Aspects of Finite Element Methods in Partial Differential Equations (C. deBoor, ed.), 313-352, Academic Press, 1974.

Three-level Galerkin methods for parabolic equations, with G. Fairweather and J. P. Johnson, SIAM J. Num. Anal. 11 (1974), 392-410.

A fast, high accuracy model for transient flow in gas pipeline systems by variational methods, parts I and II, with H. H. Rachford, Trans. Amer. Inst. Min., Pet. Engineers **257** (1974), 165-186.

H^1-Galerkin methods for Laplace and heat equations, with J. Douglas and M. F. Wheeler, Mathematical Aspects of Finite Elements in Partial Differential Equations (C. de Boor, ed.), 383-416, Academic Press, 1974.

An L^∞ estimate and a superconvergence result for a Galerkin method for elliptic equations based on tensor products of piecewise polynomials, with J. Douglas and M. F. Wheeler, RAIRO, **8** (1974), 61-66.

Galerkin methods for modeling gas pipelines, Constructive and Computational Methods for Differential and Integral Equations, Lecture Notes in Mathematics **430**, 112-130, Springer-Verlag, 1974.

The effect of interpolating the coefficients in nonlinear parabolic Galerkin procedures, with J. Douglas, Math. Comp. 29 (1975), 360-389.

Optimal L^∞ error estimates for Galerkin approximations to solutions of two point boundary value problems, with J. Douglas and L. Wahlbin, Math. Comp. **29** (1975), 475-483.

The stability in L^q of the L^2-projection into finite element function spaces, with J. Douglas and L. Wahlbin, Num. Math. 23 (1975), 193-197.

A Galerkin method for a nonlinear Dirichlet problem, with J. Douglas, Math. Comp. **29** (1975), 689-696.

Interior penalty procedures for elliptic and parabolic Galerkin methods, with J. Douglas, Lecture Notes in Physics 58, 207-216, Springer-Verlag, 1976.

Preconditioned conjugate gradient iteration applied to Galerkin methods for a mildly nonlinear Dirichlet problem, with J. Douglas, Sparse Matrix Computations, (J. R. Bunch and D. J. Rose, eds.), 333-348, Academic Press, 1976.

A unified theory of superconvergence for Galerkin methods for two point boundary problems, SIAM J. Numer. Anal. 3 (1976), 362-368.

A Galerkin method for liquid pipelines, with H. H. Rachford, Lecture Notes in Economics and Mathematical Systems **134**, 325-337, Springer-Verlag, 1976.

H^{-1} Galerkin methods for problems involving several space variables, with J. Douglas, Topics in Numerical Analysis III (John J. H. Miller, ed.), 125-141, Academic Press, 1977.

Local H^{-1} Galerkin and adjoint local H^{-1} Galerkin procedures for elliptic equations, with J. Douglas, H. H. Rachford and M. F. Wheeler, RAIRO, Numer. Anal. 11 (1977), 3-12.

A time-stepping method for Galerkin approximations for nonlinear parabolic equations, with P. Percell and J. Douglas, Lecture Notes in Mathematics **630**, 64-75, Springer-Verlag, 1977.

Development and application of variational methods for simulation of miscible displacement in porous media, with A. Settari and H. Price, Soc. Pet. Eng. Jour. 17 (1977), 228-246.

A quasi-projection analysis of Galerkin methods for parabolic and hyperbolic equations, with J. Douglas and M. F. Wheeler, Math. Comp. **32** (1978), 345-362.

Constructive polynomial approximation in Sobolev spaces, with R. Scott, Recent Advances in Numerical Analysis (C. de Boor and G. H. Golub, eds.), 31-44, Academic Press, 1978.

Polynomial approximation of functions in Sobolev spaces, with R. Scott, Math. Comp. 34 (1980), 441-463.

Incomplete iteration for time-stepping a Galerkin method for a quasilinear parabolic problem, with J. Douglas and R. E. Ewing, SIAM J. Numer. Anal. **16** (1979), 503-522.

A family of C^1 finite elements with optimal approximation properties for various Galerkin methods for 2nd and 4th order problems, with J. Douglas, P. Percell, and R. Scott, RAIRO Numerical Analysis, **13** (1979), 227-255.

An optimal order process for solving elliptic finite element equations, with R. E. Bank, Math. Comp. **35** (1981), 35-51.

Decay properties of some pipeline flow equations, presented at TICOM conference March 1979, Austin, Texas, preprint only.

A transient remote integrity monitor, with H. H. Rachford, et al., presented INTERPIPE Conference, Feb. 1980, Houston, Texas.

Analysis of a two-level scheme for solving finite element equations, with R. E. Bank, Report #159, Center for Numerical Analysis, University of Texas at Austin, 1980.

Modeling transients in multicomponent gas transmission networks, with D. Archer, K. Krueger, and H. H. Rachford, presented PSIG, 1979.

Mesh modification for evolution equations, Math. Comp. **36** (1982), 85-107.

The effect of thermal changes induced by transients in gas flow, with H. H. Rachford, presented PSIG Oct, 1980.

Changing meshes in time-dependent problems, Proceedings of the Special Year in Numerical Analysis, (I. Babuska, T.-P. Liu, and J. Osborn, eds.), University of Maryland Lecture Notes #20, College Park, 1981.

A survey of finite element for parabolic equations, Proceedings of the IMA conference on The Mathematical Basis of Finite Element Methods with Applications to Partial Differential Equations, January 1983.

An analysis of Dendy's piecewise polynomial Petrov-Galerkin method for a hyperbolic equation with stagnation points, with L. Wahlbin, Computer Methods in Applied Mechanics & Engineering **45** (1984), 167-176.

Hierarchical basis multigrid method, with R. E. Bank and H. Yserentant, Numer. Math. **52** (1988), 427-458.

Optimization of power usage in transient gas transmission lines, with H. H. Rachford, PSIG October, 1987.

Leak detection with SCADA data - limitations and possibilities, with H. H. Rachford and P. N. Anderson, Proceedings of the 1988 American Petroleum Institute Pipeline Conference, 54-76.

The rate of convergence of the modified method of characteristics for linear advection equations in one dimension, with C. N. Dawson and M. F. Wheeler, Mathematics for Large-Scale Computation (J. Diaz, ed.), Marcel-Dekker, New York, 1989, 115-126.

Mixed finite element methods for time-dependent problems: application to control, with R. Glowinski, W. Kinton, and M. F. Wheeler, Element Analysis in Fluids (T. J. Chung, ed.), 1052-1065, Hemisphere Publishing, 1992.

A Finite difference domain decomposition algorithm for the numerical solution of the heat equation, with C. N. Dawson and Q. Du, Math. Comp. **57** (1991), 63-67.

Explicit/implicit, conservative, Galerkin domain decomposition procedures for parabolic problems, with C. N. Dawson, Math. Comp. **58** (1992), 21-34.

How required compression depends on the thermodynamics of rich gas flow, with H. Rachford, in Proceedings of PSIG, 1992.

Droplet breakup in a model of the Hele-Shaw cell, with P. Constantin, R. E. Goldstein, L. P. Kadanoff, M. J. Shelley, and S.-M. Zhou, Phys. Rev. E **47** (1993), 4169-4181.

Finite-time singularity formation in Hele-Shaw systems with R. E. Goldstein, L. P. Kadanoff, and S.-M. Zhou, Phys. Rev. E **47** (1993), 4182-4196.

The influence of spatial inhomogeneities on neutral models of geographical variation, III. Migration across a geographical barrier, with T. Nagylaki and P. T. Keenan, in Theoretical Population Biology **43** (1993), 217-249.

Explicit/implicit, conservative domain decomposition methods for parabolic problems based on block-centered finite differences, with C. Dawson, SIAM Jour. Numer. Anal. **31** (1994), pp 1045-1061.

Noniterative domain decomposition for second order hyperbolic problems, with C. Dawson, in Domain Decomposition Methods in Science and Engineering, A. Quarteroni, et al., ed, pp 45-52, Amer. Math. Soc. Contemporary Mathematics Series vol 15, 1994.

Drop Formation in a One-Dimensional Approximation of the Navier-Stokes Equation, with Jens Eggers, J. Fluid Mech. 262(1994), 205-221.

Singularities and similarities in interface flows, with M. Brenner, A. Bertozzi, and L. Kadanoff, in Trends and Perspectives in Applied Mathematics, pp 155-208, L. Sirovich ed., volume 100, Springer Verlag Applied Mathematical Sciences, 1994

A priori estimates for mixed finite element approximations of second order hyperbolic equations with absorbing boundary conditions, with L. Cowsar and M. F. Wheeler, in SIAM Jour. Numer. Anal., **33** (1996), 492-504.

Superconvergence and postprocessing of fluxes from lowest order mixed methods on triangles and tetrahedra, with P. T. Keenan, SIAM Jour. Sci. Comput., **19** (1998), 1322-1332.

Bubble shape oscillations and the onset of sonoluminescence, with Michael P. Brenner and Detlef Lohse, Phys. Rev. Let., **75**(1995), 954-957.

Mechanisms for stable sonoluminescence, with Michael P. Brenner, Detlef Lohse, and David Oxtoby, Phys. Rev. Let. **76**(1996), 1158.

Capillary flow as the cause of ring stains from dried liquid drops with R. Deegan, G. Huber, S. Nagel, O. Bakajin, T. Witten, and Ed Ehrichs, Nature, Oct. 23, 1997.

Dispersion correction methods for the wave equation, with Mark C. Haase, preprint.

Layer formation in monodisperse suspensions and colloids, with A. E. Hosoi, Jour. Fluid Mech. **328**(1996), 297-311.

Sonoluminescing air bubbles rectify argon, with Detlef Lohse, Michael P. Brenner, Sascha Hilgenfeldt, and Blaine Johnston, Phys. Rev. Let. **78**(1997), 1359-1362.

Some reduced-dimension models based on numerical methods, with A. E. Hosoi, Modeling and Computation for Applications in Science and Engineering, J. W. Jerome editor, 1998, Oxford Universtiy Press, 59-80.

Galerkin methods in age and space for a population model with nonlinear diffusion, with Bruce Ayati, SIAM Jour Numer Anal.**40** (2001), 1064-1076.

The influence of spatial inhomogeneities on neutral models of geographical variation: IV. Discontinuities in the population density and migration rate, with Bruce Ayati and Thomas Nagylaki, Theoretical Population Biology, 56(1999), 337-347.

Contact line deposits in an evaporating drop, R. D. Deegan, O. Bakajin, T. F. Dupont. G. Huber, S. R. Nagel, and T. A. Witten, Phys. Rev. E. v62(2000), 756-765.

Symmetric error estimates for moving mesh Galerkin methods for advection diffusion equations, T.F. Dupont, Y. Liu, SIAM Jour Numer Anal. **40** (2002), 914-927.

Symmetric error estimates for moving mesh mixed methods for advection diffusion equations, Y. Liu. R. Bank, T.F. Dupont, S. Garcia, and R. Santos, SIAM Jour Numer Anal. **40** (2003), 2270-2291.

Singularity formation in free surface Stokes flows, Q. Nie, S. Tanvier, T.F. Dupont, and X. Li, Recent Advances in Numerical Methods for Partial Diffential Equations and Applications, X. Feng and T. Schulze (eds.), CONM 306, AMS, 2002, 147-165.

On Validating an Astrophysical Simulation Code , A. C. Calder, B. Fryxell, T. Plewa, R. Rosner, L. J. Dursi, V. G. Weirs, T. Dupont, H. F. Robey, J. O. Kane, B. A. Remington, R. P. Drake, G. Dimonte, M. Zingale, F. X. Timmes, K. Olson, P. Ricker, P. MacNeice, and H. M. Tufo, Ap. J S **143** (2002), 201-229.

Back and forth error compensation and correction methods for removing errors induced by uneven gradients of the level set function, T. Dupont and Y. Liu, J. Comp. Phys. **190** (2003) 311-324.

Validating Astrophysical Simulation Codes , A. C. Calder, L. J. Dursi, B. Fryxell, T. Plewa, V. G. Weirs, T. Dupont, H. F. Robey, J. O. Kane, B. A. Remington, F. X. Timmes, G. Dimonte, J. Hayes, M. Zingale, R. P. Drake, P. Ricker, J. Stone, and K. Olson, Comp. Sci. & Eng. **6** (2004), 10-20.

Failure of the discrete maximum principle for an elliptic finite element problem, A. Draganescu, T.F. Dupont, L.R. Scott, Math. Comp., **74** (2005), 1-23.

Convergence of a step-doubling Galerkin method for parabolic problems, Bruce Ayati and Todd F. Dupont Math. Comp., **74** (2005) 1053-1065.

Back and Forth Error Compensation and Correction Methods for Semi-Lagranging Schemes with Application to interface computation using Level Set Method, Todd F. Dupont and Yingjie Liu, Math. Comp. **76** (2007) 647-668.

An optimal order multilevel preconditioner for regularized ill-posed problems, Andrei Draganescu and Todd F. Dupont, to appear, Math. Comp., 208.

Mollified Birth in Moving-Grid Galerkin Methods for Age- and Space-Structured Biological Systems, Bruce Ayati and Todd F. Dupont, submitted

Dimension reduction applied to a model of sea breezes, Itir Mogultay, Todd F. Dupont, and Gidon Eshel, submitted.

Transient optimization can help operators control a complex system forced to deliver transient loads, R.G. Carter, H.H. Rachford, Jr., and T.F. Dupont, Pipeline and Gas Technology, July, 2007, vol 6, num. 6, pp 18-25.

Three-dimensional effects in shock-cylinder interactions, V. Gregory Weirs, Todd F. Dupont, and Tomasz Plewa, Phys of Fluids, vol 20, 2008.

A symmmetric error estimate for the Galerkin approximations of time-dependent Navier-Stokes equations in two dimensions, Todd F. Dupont and Itir Mogultay, submitted.