

## Curriculum Vita

Saleh A. Tanveer

### Education

Ph.D.	Applied Mathematics California Institute of Technology	1984
M.S.	Civil Engineering California Institute of Technology	1982
M.A.	Mathematics Claremont Graduate School, Claremont, CA	1979
B.A.	Math and Physics major Pomona College, Claremont, CA (Graduated first in the class of 1979.)	1979

### Employment

Professor,	Department of Mathematics The Ohio State University 1995–
Visiting Fellow,	Institute for Mathematical Sciences Imperial College, U.K. 2005-2006
Vice Chair,	Department of Mathematics The Ohio State University 2002-2005
Visiting Professor,	Department of Mathematics The University of Chicago 1996–1997
Associate Professor,	Department of Mathematics The Ohio State University 1989–1995
Assistant Professor,	Department of Mathematics Virginia Polytechnic Institute and State University 1984–1989
Visiting Associate,	Applied Mathematics California Institute of Technology January 1986 to August 1987
Research Fellow,	Applied Mathematics California Institute of Technology November 1983 to August 1984

### Editorial and Professional activities

Guest Editor, Journal of Fluid Mechanics, V409, 2000  
Co-Editor, Proceedings on Asymptotics Beyond All Order, 1991  
Consultant, Institute for Computer Applications in Science and Engineering (ICASE), ('88-'94)  
Member, NSF and NASA peer-review panels

### Honors & Grant Awards

1. Francois Frenkiel Prize, American Physical Society, Fluid Dynamics Divn., 1987.
2. NSF Grant DMS 1515755, '15-'18 (with O.Costin)
3. NSF Grant DMS 110894, '11-'15 (with O.Costin)
4. NSF Grant DMS 0807266, '08-'11 (with O. Costin)
5. NSF Grant DMS 0733778, '07-'08
6. NSF Grant DMS 0405837, '04-'07
7. NASA Grant NAG3-2700, '02-'06 (with M. Foster)
8. NSF Grant DMS-0103829, '01-'04
9. NSF Grant DMS-9803358, '98-'01
10. NASA Grant NAG-3-1947, '96-'00 (with G. Baker, M. Foster)
11. NSF Grant DMS 9500986, '95-'98
12. NASA Grant NAG-3-1415, '93-'96 (with G. Baker, M. Foster)
13. D.O.Energy Grant DE-FG02-92ER14270, '92-'95
14. NSF Grant DMS 9107608, '91-'93
15. NSF Grant DMS 8713246, '87-'91

### List of articles in refereed Journals

70. Analysis of 2+1 diffusive-dispersive PDE arising in river braiding (with C. Tsikkou), *Eur. J. Appl. Maths.* **27** (5), pp 756-780 (2016).
69. Travelling wave states in pipe flow (with O. Ozcaikir, P. Hall and E. Overman), **J. Fluid Mech**, **791**, pp 284-328 (2016).
68. Hybrid basis scheme for computing electrostatic fields exterior to close-to-touching discs (with D.Crowdy & T. DeLillo), *IMA J. Numer. Anal.*, **36** (2), pp 743-769 (2016).
67. Existence, uniqueness, analyticity and Borel summability for Boussinesq equations (with H. Rosenblatt), *J. Diff. Eqns.* **258** (10), pp 3391-3434, 2015.
66. Analytical approximation of Blasius similarity solution with rigorous error bounds (with O. Costin), *SIAM J. Math. Anal.* **46** (6), pp 3782-3813 (2014)
65. A quasi-solution approach to nonlinear problems—the case of Blasius similarity solution (with O. Costin, T. Kim), *Fluid. Dyn. Res.*, **46**, 031419 (2014)
64. Proof of the Dubrovin conjecture and analysis of the tritronqu'ee solutions of P-1 (with O.Costin & M. Huang), *Duke J. Math.*, **163** (4), pp 665-704 (2014)

63. The lifetime of shape oscillations of a bubble in an unbounded, inviscid and compressible fluid with surfacetension (with O. Costin, M. Weinstein), *SIAM J. Math. Anal.*, **45** (5), pp 2924-2936 (2013)
62. Semiclassical low energy scattering for one-dimensional Schroedinger operators with exponentially decaying potentials (with O. Costin, R. Donninger, W. Schlag), *Annales Henri Poincaré*, **13** (6), pp 1371-1426 (2012).
61. Global existence for a translating near-circular Hele-Shaw bubble with surface tension (with J. Ye), *SIAM J. Math. Anal.* **43**, pp 457-506 (2011).
60. Global solutions for two-phase Hele-Shaw bubble for a near-circular initial shape (with J. Ye), *Complex Variables and Elliptic Equations*, **57**, 1747-6941 (2011).
59. Multiple scales in streamer discharges, with an emphasis on moving boundary approximations. (with U Ebert, F. Brau, G Derks, W Hundsdorfer, C-Y Kao, C Li, A Luque, B Meulenbroek, S Nijdam, V Ratushnaya, L Schfer) *Nonlinearity*, **24**, pp C1-C26 (2011)
58. Integral formulation of 3-D Navier-Stokes and longer time existence of smooth solutions (with O. Costin and G. Luo), *Comm. Contemp. Math*, **13** (3), pp 407-462 (2011)
57. A moving boundary problem motivated by electric breakdown: II. Initial Value Problem (with C-Y. Kao, L. Schafer, F.Brau, U. Ebert), *Physica D* **239**, pp 1542-1559 (2010)
56. Exact results for ionization of model atomic systems (with O. Costin, J.L Lebowitz, C. Stucchio), *J. Math Phys.*, **51** (1), pp 015211-1 to 015211-16 (2010).
55. Ionization of Coulomb Systems in  $R^3$  by time periodic forcings of arbitrary size (with O. Costin and J.L. Lebowitz), *Comm. Math. Phys.*, **296** (3), pp 681-738 (2010).
54. Short time existence and Borel Summability of Navier-Stokes equation in  $R^3$  (O. Costin & S. Tanveer), *Comm. PDEs*, V **34** (8), pp 785-817 (2009).
53. A moving boundary problem motivated by electric breakdown: I. Spectrum of linear perturbations (S. Tanveer, L. Schafer, F. Brau, U. Ebert), *Physica D* **238**, pp 888-901, 2009.
52. An integral equation approach to smooth 3D Navier-Stokes solution (O. Costin, G. Luo & S. Tanveer), *Physica Scripta* **T132**, 2008.
51. Semiclassical analysis of low and zero energy scattering for 1-D Schrodinger operators with inverse square potentials (O. Costin, W. Schlag, W. Staubach & S. Tanveer), *J. Functional Analysis*, **255**, pp. 2321-2362 (2008).
50. Divergent expansion, Borel summability and three-dimensional Navier-Stokes equation (O. Costin, G. Luo, S. Tanveer), *Phil. Trans. R. Soc. A*, **366** (1876), pp 2775-2788 (2008).
49. Nonlinear evolution PDEs in  $R^+ \times C^d$  : existence and uniqueness of solutions, asymptotic and Borel summability properties, (O. Costin & S. Tanveer), *Annales De L Institut Henri Poincare-Analyse Non Lineaire*, **24** (5), pp 795-823 (2007).
48. Complex Singularity Analysis for a Nonlinear PDE (O. Costin & S. Tanveer, *Comm. Partial Differential Equations*, **31** (4), pp593-637 (2006).
47. On a pair of interacting bubbles in planar Stokes flow (D.Crowdy, S. Tanveer & G.L. Vasconcelos), *J. Fluid Mech*, **541**, pp 231-261, (2005).

46. Analyzability in the context of PDEs and applications (O. Costin & S. Tanveer), *Annales de la Faculte des Sciences de Toulouse*, **XIII**, 4, pp 439-449 (2004).
45. The Effect of Finiteness in the Saffman-Taylor Viscous Fingering Problem (D.Crowdy & S. Tanveer), *J. Stat. Physics.*, **114**, pp 1501-1536, 2004.
44. Rigorous Results in Steady Finger Selection in Viscous Fingering (X. Xie & S. Tanveer), *Archives for Rational Mechanics and Analysis*, **166**, pp 219-286, 2003
43. Analyticity and nonexistence of classical steady Hele-Shaw fingers, (S. Tanveer & X. Xie), *Communications on Pure and Applied Mathematics*, **LVI**, pp 353-402, 2003.
42. Singularity Formation in Free-Surface Stokes Flows, (Q. Nie, S. Tanveer, T.F. Dupont & X. Li), *Contemporary Mathematics*, **306**, pp147-163, 2002
41. Existence and Uniqueness for a Class of Nonlinear Higher-Order partial differential equations in the Complex Plane (O. Costin & S. Tanveer), *Comm. Pure Applied Math*, **LIII**, pp 1092-1117, 2000.
40. Surprises in viscous fingering (S. Tanveer), *J. Fluid Mechanics* 409, pp 273-308, 2000.
39. Bounds for Second Order Structure Functions And Energy Spectrum in Turbulence (P. Constantin, Q. Nie & S. Tanveer), *Phys. Fluids* 11, pp 2251-2256, 1999.
38. Dendritic Crystal Growth for weak undercooling, Part II: Surface energy effects on nonlinear evolution (M.D. Kunka, M.R. Foster & S. Tanveer), *Phys. Rev. E*, 59, pp 673-710, 1999.
37. A note on third order structure functions in turbulence (Q. Nie & S. Tanveer), *Proc. Roy. Soc. London A*, 455, pp 1615-1636, 1999.
36. On the formation of Moore curvature singularities in vortex sheets (S.J. Cowley, G.R. Baker & S. Tanveer), *J. Fluid Mech.* 378, pp 233-268, 1999.
35. A Theory of Exact Solutions for Annular Viscous Blobs (D.G. Crowdy & S. Tanveer), *Journal of Nonlinear Science*, 8, pp 375-400 (1998).
34. A Hele-Shaw Problem and the Second Painleve' Transcendent (A.S. Fokas & S. Tanveer), *Math Proc. Camb. Phil. Soc.*, 124, pp 169-191, 1998.
33. A Theory of Exact Solutions for Plane Viscous Blobs (D.G. Crowdy & S. Tanveer), *Journal of Nonlinear Science.*, 8, pp 261-279 (1998)
32. Dendritic Crystal Growth for Weak Undercooling (M.D. Kunka, M.R. Foster & S. Tanveer), *Phys. Rev. E.*, 56, pp 3068-3100, 1997.
31. Singular effects of surface tension in evolving Hele-Shaw flows (M. Siegel, S. Tanveer & W.S. Dai), *Journal of Fluid Mechanics*, 323, pp 201-236, 1996.
30. Singular perturbation of smoothly evolving Hele-Shaw solutions, (M. Siegel & S. Tanveer), *Physical Review Letters*, 76, 419-422, 1996.
29. Asymptotic calculation of three-dimensional thin-film effects on unsteady Hele-Shaw fingering, (S. Tanveer), *Phil. Trans. R. Soc. London*, A 354, pp 1065-1097, 1996.
28. Some analytical properties of a 2-D steadily translating inviscid bubble (S. Tanveer), *Proc. R. Soc. London A* 452, pp 1397-1410, 1996.
27. A well-posed numerical method to track isolated conformal map singularities in Hele-Shaw flow (G.R. Baker, Michael Siegel & S. Tanveer), *Journal of Computational Physics*, **120**, pp 348-364, 1995.

26. Time-evolving bubbles in two dimensional Stokes flow (S. Tanveer & G.L. Vasconcelos), *Journal of Fluid Mechanics*, 301, pp 325-344, 1995.
25. The Stability of a 2-D Rising Bubble (Q. Nie & S. Tanveer), *The Physics of Fluids*, **7**, pp 1292-1306, 1995.
24. Bubble Breakup in Two Dimensional Stokes Flow (S. Tanveer & G.L. Vasconcelos), *Phys. Rev. Lett.* **73** (21), pp 2845-2848, 1994.
23. Convection effects on Radial Segregation and crystal melt interface in vertical Bridgman growth, (S. Tanveer), *The Phys. Fluids* **6**, pp 2270-2292, 1994.
22. Singularities of the Euler Equation and Hydrodynamic Stability, (S. Tanveer & C.G. Speziale), *Phys. Fl. A*, **5**, pp 1456-1465, 1993.
21. Singularities in the classical Rayleigh-Taylor Flow: Formation and Subsequent motion, (S. Tanveer), *Proc. Roy. Soc. London A.*, **441**, pp 501-525, 1993.
20. Evolution of Hele-Shaw interface for small surface tension, (S. Tanveer), *Phil. Trans. Royal Soc. London A.*, **343**, pp 155-204, 1993.
19. Singularities in water waves and the classical Rayleigh-Taylor problem, (S. Tanveer) *Proc. Roy Soc. London A.*, **435**, pp 137-158, 1991.
18. Infinite Stream of Hele-Shaw Bubbles, (D. Burgess & S. Tanveer), *Phys. Fl. A* **3**, pp 367-379 (1991).
17. Analytic theory for the selection of Saffman-Taylor finger in the presence of thin film effects, (S. Tanveer), *Proc. Royal Soc. London A* **428**, pp 511-545, 1990
16. Analytic theory for the determination of Velocity and Stability of Bubbles in a Hele-Shaw cell, Part II: Stability, (S. Tanveer), *Journal of Theoretical and Computational Fluid Dynamics*, Vol 1, No. 3, pp. 165-178, 1989.
15. Analytic theory for the determination of Velocity and Stability of Bubbles in a Hele-Shaw cell, Part I: Velocity selection, (S. Tanveer), *Journal of Theoretical and Computational Fluid Dynamics*, Vol 1, No.3, pp. 135-164, 1989
14. Analytic theory for the selection of a two-dimensional needle crystal at arbitrary Peclet number, (S. Tanveer), *Phys. Rev. A* **40**(8), 4756-4769, 1989
13. Prediction of bubble velocity in a Hele-Shaw cell: thin film and contact angle effects, (P.G. Saffman & S. Tanveer), *Phys. Fluids A*, **32**, 2, pp 219-223, 1989
12. The effect of finite viscosity ratio on the stability of fingers and bubbles in a Hele-Shaw cell, *Phys. Fluids*, **31**, 11, pp 3188-3198, 1988 (S.Tanveer & P.G. Saffman),
11. The calculation of some Batchelor flows: the Sadvovskii vortex and rotational corner flow, *Phys. Fluids*, **31**, 5, pp 978-990, 1988 (D.W.Moore, P.G. Saffman & S.Tanveer).
10. Stability of Bubbles in a Hele-Shaw Cell, *Phys. Fluids*, **30**, 9, pp 2624-2635, 1987 (S.Tanveer & P.G. Saffman).
9. Analytic Theory for the Linear Stability of Saffman-Taylor Finger, *Phys. Fluids*, **30**, 8, pp 2318-2329, 1987 (S.Tanveer).
8. Analytic Theory for the Selection of Symmetric Saffman-Taylor Finger in a Hele-Shaw Cell, *Phys. Fluids*, **30**, 6, pp 1589-1605, 1987 (S.Tanveer).
7. New Solutions for Steady Bubbles in a Hele-Shaw Cell, *Phys. Fluids*, **30**, 3, pp 651-660, 1987 (S.Tanveer).

6. The Effect of Surface Tension on the Shape of a Hele-Shaw Cell Bubble, *Phys. Fluids*, **29**, 11, pp 3537-3548, 1986 (S.Tanveer).
5. A Pair of Steadily Translating Vortices with Vortex Sheets on their Boundaries, *Studies in Applied Math*, **74**, pp 139-154, 1986 (S.Tanveer).
4. Vortex Induced Lift on a Flat Plate with a Curved Forward Facing Flap, *Studies in Applied Math*, **72**, pp 173-187, 1985 (S.Tanveer).
3. Vortex Induced Lift on Two Dimensional Low Speed Wings, *Studies in Applied Math*, Vol. LXXI, **1**, pp 65-78, 1984 (P.G. Saffman & S.Tanveer).
2. Prandtl-Batchelor Flow Past a Flat Plate with a Forward Facing Flap, *J. Fluid Mech.*, **143**, pp 351-365, 1984 (P.G. Saffman & S.Tanveer).
1. A Pair of Touching Vortices in a Uniform Stream, *Phys. Fluids*, **25**, 11, pp 1929-1930, 1982 (P.G. Saffman & S.Tanveer).

### Selected Invited Presentations

1. Applied Math Colloquium Speaker, Caltech, 1984, '86 & '97.
2. Harvard University Applied Mathematics & Mechanics colloquium, February 1988
3. Princeton University Applied and Computational Mathematics colloquium, February 1988
4. Invited speaker and participant, NATO ASI conference on Nonlinear phenomena in Growth and Forms, Cargese, France, July, 1990.
5. Invited speaker and participant, NATO ARW workshop on Asymptotics beyond all orders, San Diego, California, Jan, 1991.
6. Invited speaker, IMA, U. Minnesota, March 1991, July, 2008.
7. Invited speaker and participant, International Nonlinear Water Wave Workshop, Bristol, England, October, 1991.
8. North Western University, Engineering Science and Applied Mathematics Colloquium speaker, Oct. 1991, April 1997.
9. University of Chicago, Program in Applied and Computational Mathematics Seminar speaker, October, 1991, October, 1996, March 2009.
10. Invited speaker and participant, NATO ARW workshop on "Singularities in Fluids, Plasmas and Optics", Crete, Greece, July 5-10, 1992
11. Invited speaker, Workshop on Asymptotic Methods, Applied Mathematics and Mechanics, Mexico City, April 12-15, 1993.
12. Invited Speaker, Workshop on Free Boundary Problems, sponsored by the European Science Foundation at Oxford U., England, Dec. 17-20, '93.
13. Invited Speaker and Organizer of mini-symposia at the International Congress of Industrial and Applied Mathematics (ICIAM '95) in Hamburg, Germany July 3-7, '95.
14. Invited Speaker, Applied Mathematics Colloquium, U. of Edinburgh, England, May 12, 1995, Feb 27, 2006.
15. Invited Speaker, Applied Mathematics and Fluid Mechanics Seminars, Imperial College, London, May 3, 1995, Nov. 2, 2005, Jan. 13, 2012

16. Invited Speaker, Mechanics/Fluid Mechanics seminars, Department of Applied Math and Theoretical Physics, Cambridge University, May 9, 1995, Oct 24, 2005, October 16, 2009.
17. Invited Speaker on Exponential Asymptotics, London Mathematical Society, Spitalfields Day, April 24, 1995.
18. Plenary Speaker, ISAAC conference, June 3-7, '97, U. of Delaware.
19. Invited Speaker, MIT physical mathematics seminar, Sept. 15, '98.
20. Math Colloquium, Rutgers University, March 19, '99.
21. Invited Speaker, Conferences on Turbulent Mixing and Beyond, ICTP, Trieste, Italy, August, 2007, August 2011.
22. Invited Speaker, Free Boundary Problems, Stockholm, June 2008.
23. Invited Speaker, Asymptotics in dynamics, geometry and PDEs; generalized Borel summation, Oct 12-16, 2009, Centro di Ricerca Matematica, Pisa, Italy.
24. Invited participant, workshop on Laplacian growth, BIRS, Banff, Canada, Nov. 2010.

### **List of Ph.D Students and Post Doctoral Fellows supervised**

Dr. Heather Rosenblatt, Ph.D in Mathematics, 2013.

Dr. Ji Ye, Ph.d in Mathematics, 2010.

Dr. Guo Luo, Ph.D in Mathematics, 2008 (Joint Advisor)

Dr. Xing Liu, Ph.d in Mathematics, 2004.

Dr. Xuming Xie, Ph.d in Mathematics, 2000.

Dr. Darren Crowdy, Ph.D in Applied Mathematics (Caltech), 1998 (Joint Advisor)

Dr. Mark Kunka, Ph.D in Aeronautics, 1995, (Joint Advisor)

Dr. Qing Nie, Ph.D in Mathematics, 1995 (Joint Advisor)

Dr. G.L. Vasconcelos (Ph.d., U. Chicago, '93). Post-Doctoral Fellow '93-'94.

Dr. Michael Siegel, Post Doctoral Fellow '94-'95.