

DAVID HALPERN

PERSONAL INFORMATION:

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EDUCATION:

1985-1989 Ph.D. in Applied Mathematics, University of Arizona, Tucson, Arizona. Thesis title: The squeezing of red blood cells through tubes and channels of near-critical dimensions. Research supervised by Prof. T.W. Secomb.

1984-1985 Certificate of Advanced Study in Mathematics (Part III of the Mathematical Tripos), University of Cambridge, Cambridge, England.

1981-1984 B.Sc. (First Class Hons.) in Mathematics, University of Bristol, England

APPOINTMENTS:

2004-Present Professor, Department of Mathematics, University of Alabama, Tuscaloosa, AL.

1998-2004 Associate Professor, Department of Mathematics, University of Alabama, Tuscaloosa, AL.

August 2003-December 2003 Visiting Associate Professor, Department of Biomedical Engineering, Tulane University, New Orleans, LA.

January 2003-July 2003 Visiting Associate Professor, Department of Biomedical Engineering, University of Michigan, Ann Arbor MI.

Fall 1999-Spring 2000 Visiting Scholar, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Cambridge, UK.

Summer 98-00 Visiting Scholar, Department of Biomedical Engineering, University of Michigan, Ann Arbor MI.

Summers 96-00 Consultant, Biomedical Engineering Department, Tulane University, New Orleans, LA.

1993-1998 Assistant Professor, Department of Mathematics, University of Alabama, Tuscaloosa, AL.

Summers 94-97 Visiting Scholar, Department of Biomedical Engineering, Northwestern University, Evanston, IL.

1990-1993 Research Assistant Professor, Department of Biomedical Engineering, Northwestern University, Evanston, IL.

1989-1990 Postdoctoral Research Fellow, Department of Biomedical Engineering, Northwestern University, Evanston, IL.

1985-1989 Graduate Research Assistant in Physiology and Arizona Research Laboratories, University of Arizona, Tucson, AZ.

SOCIETIES: American Physical Society.

LIST OF PUBLICATIONS:

1. **Halpern, D.** and Secomb, T.W. The squeezing of red blood cells through capillaries with near-minimal diameters. *J. Fluid Mech.* **203**: 381-400, 1989.
2. **Halpern, D.** and Secomb, T.W. Viscous motion of disc-shaped particles through parallel-sided channels with near minimal widths. *J. Fluid Mech.* **231**: 545-560, 1991.
3. Elad, D., **Halpern, D.** and Grotberg, J.B. Gas bolus dispersion in volume-cycled tube flow. Part I: Theory. *J. Applied Physiology* **72**: 312-320, 1992.
4. **Halpern, D.** and Grotberg, J.B. Dynamics and transport of a localized soluble surfactant on a thin film. *J. Fluid Mech.* **237**: 1-11, 1992.
5. **Halpern, D.** and Secomb, T.W. The squeezing of red blood cells through parallel-sided channels with near-minimal widths. *J. Fluid Mech.* **244**: 307-322, 1992.
6. **Halpern, D.** and Grotberg, J.B. Fluid-elastic instabilities of liquid lined flexible tubes: *J. Fluid Mech.* **244**: 615-632, 1992.
7. **Halpern, D.** and Grotberg, J.B. Surface-tension instabilities of liquid lined elastic tubes. *Contemporary Mathematics* **141**: 295-316, 1993. In Fluid Dynamics in Biology, proceeding of an AMS-IMS-SIAM Joint Research Conference held July 6-12, 1991, edited by A.Y. Cheer and C.P. van Dam.
8. **Halpern, D.** and Grotberg, J.B. Surfactant effects on fluid elastic instabilities of liquid lined flexible tubes: a model of airway closure. *J. Biomech. Eng.* **115**: 271-277, 1993.
9. Jensen, O.E., **Halpern, D.** and Grotberg, J.B. Transport of a passive solute by surfactant-driven flows. *Chem. Eng. Sci.* **49** (8): 1107-1117, 1994.
10. **Halpern, D.** and Gaver, D.P. Boundary element analysis of the time-dependent motion of a semi-infinite bubble in a channel. *J. Comp. Phys.* **115** (2): 366-375, 1994.
11. Grotberg, J.B., **Halpern, D.** and Jensen, O.E. The interaction of exogenous and endogenous surfactant: spreading-rate effects. *J. Applied Physiology* **78**: 750-756, 1995.

12. Gaver, D.P., **Halpern, D.**, Jensen, O.E. and Grotberg, J.B. The motion of a semi-infinite bubble through a flexible-walled channel. *J. Fluid Mech.* **319**: 25-45, 1996.
13. **Halpern, D.**, Jensen, O.E. and Grotberg, J.B. A theoretical study of surfactant and liquid delivery into the lung. *J. Applied Physiology* **85**: 333-352, 1998.
14. Jensen, O.E. and **Halpern, D.** The stress singularity in surfactant-driven-film flows. Part 1. Viscous effects. *J. Fluid Mech.* **372**: 273-300, 1998.
15. Cassidy, K.J, **Halpern, D.**, Ressler, B.G. and Grotberg, J.B. Surfactant effects in model airway closure experiments. *J. Applied Physiology* **87**: 415-427, 1999.
16. **Halpern, D.** Jiang, Y. and Himm, J.F. Mathematical modeling of gas bubble evolution in a straight tube. *J. Biomech. Eng.* **121** (5): 505, 1999.
17. Faybishenko, B., Babchin, A.J., Frenkel, A.L., **Halpern, D.** and Sivashinsky, G.I. A model of chaotic evolution of an ultrathin film down an inclined plane. *Colloids & Surfaces* **192**: 377-385, 2001.
18. Ghadiali, S.N., **Halpern, D.** and Gaver, D.P. A dual-reciprocity boundary element method for evaluating bulk convective transport of surfactant in free surface flows. *J. Comp. Phys.* **171**: 534-559, 2001.
19. **Halpern, D.** and Frenkel, A.L. Saturated Rayleigh-Taylor instability of an oscillating Couette film flow. *J. Fluid Mech.* **446**: 67-93, 2001.
20. **Halpern, D.** and Jensen, O.E. A semi-infinite bubble advancing into a planar tapered channel. *Phys. Fluids.* **14**(2): 431-442, 2002.
21. Jensen, O.E., Horsburgh, M.K., **Halpern, D.** & Gaver, D.P. III The steady propagation of a bubble in a flexible-walled channel: asymptotic and computational models. *Phys. Fluids.* **14**(2): 443-457, 2002.
22. Frenkel, A.L. and **Halpern, D.** Stokes-flow instability due to interfacial surfactant. *Phys. Fluids.* **14** (7): L45-L48, 2002.
23. Wei, H.H., Benintendi, S.W., **Halpern, D.** and Grotberg, J.B. Cycle-induced flow and transport in a model of alveolar liquid lining. *J. Fluid Mech.* **483**: 1-36, 2003.
24. **Halpern, D.** and Frenkel, A.L. Destabilization of a creeping flow by interfacial surfactant: Linear theory extended to all wavenumbers. *J. Fluid Mech.* **485**: 191-220, 2003.
25. **Halpern, D.** and Grotberg, J.B. Nonlinear Saturation of the Rayleigh instability in a liquid-lined tube due to oscillatory flow. *J. Fluid Mech.* **492**: 251-270, 2003.
26. **Halpern, D.**, Bull, J.L. and Grotberg The effect of airway wall motion on surfactant delivery. *J. Biomech. Eng.* **126**(4): 410-419, 2004.
27. Frenkel, A.L. and **Halpern, D.** Effect of inertia on the insoluble surfactant instability of a shear flow. *Phys. Rev. E* **71**, 016302, 2005.
28. **Halpern, D.**, Naire, S., Jensen, O.E. and Gaver, D.P. Unsteady bubble propagation in a flexible channel: predictions of a viscous stick-slip instability. *J. Fluid Mech.* **528**, 53-86, 2005.
29. Wei, H.-H., **Halpern, D.** and Grotberg, J.B. Interfacial Stability of a Time-Periodic Core-Annular Flow in the Presence of Surfactant. *J. Colloid and Interface Science*, **28**, 769-780, 2005.
30. Frenkel, A.L. and **Halpern, D.** Strongly nonlinear nature of interfacial-surfactant instability of Couette flow. *Int. J. Pure Appl. Math.* **29**(2), 205-224, 2006.
31. **Halpern, D.** and Wei, H.-H. Electroosmotic flow in a microcavity with nonuniform surface charges. *Langmuir*, **23**(18), 9505-9512, 2007.
32. **Halpern, D.** and Frenkel, A.L. Nonlinear evolution, travelling waves, and secondary instability of sheared-film flows with insoluble surfactant. Accept for publication *Journal of Fluid Mechanics*, 2007.

BOOKS

1. Wilson, H.B., Turcotte, L.H. and Halpern D. (2002) *Advanced Mathematics and Mechanics Applications Using MATLAB*, Third Edition, CRC press.

BOOK CHAPTERS

1. Gaver, D.P., Jensen, O.E. and **Halpern, D.** (2003) Surfactant and airway liquid flows. To appear in "Recent research developments in lung surfactant and its dysfunction" Editor: K. Nag. Publisher Marcel-Dekker.

REFEREED PROCEEDINGS:

1. Halpern, D., B. Hamer and J.B. Grotberg. Capillary-elastic instabilities of liquid-lined flexible tubes: a model of airway closure. In *Advances in Bioengineering*, ed. Tarbell, J.M., Proceedings of the ASME, BED-Vol. 26:223-226, 1993.
2. Jensen, O.E., Halpern, D. and Grotberg, J.B. (1993) Surfactant-driven flows on thin viscous films: pulmonary drug delivery. In *Surface-tension-driven flows*, ed. Neitzel, G.P. and Smith, M.K. Proc. ASME, AMD 170, 47-55.
3. Halpern, D., Moriarty, J.A. and Grotberg, J.B. (1999) Capillary-Elastic Instabilities with an Oscillatory Forcing Function. In *IUTAM Symposium on Non-linear Singularities in Deformation and Flow*. Editors, Durban, D. and Pearson, J.R.A., pp. 243-255. Publishers: Kluwer Academic, Dordrecht, The Netherlands.
4. Mai, T.Z., Chen, X. and Halpern, D. (1999) SJSOR Additive Iterative Methods for solving Linear Systems. In *Iterative Methods in Scientific Computation IV*. Editors, David Kincaid and Anne Elster, Volume 5, pp. 73-84. Publishers: IMACS (International Association for Mathematics and Computers in Simulation).
5. Halpern, D. and Grotberg, J.B. (2000) Oscillatory shear stress induced stabilization of thin film instabilities. In: *IUTAM Symposium on Nonlinear Waves in Multiphase Flow*. Editor, Chang, H.-C, Volume 57, pp. 33-43. Publishers: Kluwer Academic, Dordrecht, The Netherlands.
6. Frenkel, A.L. and Halpern, D. (2000) On saturation of Rayleigh-Taylor instability. In: *IUTAM Symposium on Nonlinear Waves in Multiphase Flow*. Editor, Chang, H.-C, Volume 57, pp. 69-79. Publishers: Kluwer Academic, Dordrecht, The Netherlands.

TECHNICAL REPORTS:

1. Babchin, A.J., Faybishenko, B., Sivashinsky, G.I., Frenkel, A.L., and Halpern, D. (2000) A model of chaotic evolution of slow liquid film on an inclined plane: one dimension solution. Lawrence Berkeley National Laboratory Tech. Report No. 42884.