Spencer H. Bryngelson

Compiled on: February 20, 2021

1 Basic information

- Title: Senior Postdoctoral Scholar
- Institution: California Institute of Technology
- Address: 1200 E. California Blvd., Pasadena, CA 91104 MC104-44
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2 Education

- University of Illinois at Urbana–Champaign
  - (2017) Doctor of Philosophy, Theoretical & Applied Mechanics
  - (2015) Master of Science, Theoretical & Applied Mechanics
  - (2015) Graduate Certificate, Computational Science & Engineering
- University of Michigan–Dearborn
  - (2013) Batchelor of Science, Mechanical Engineering
  - (2013) Batchelor of Science, Engineering Mathematics

3 Research positions

- (2018–Present) Senior Postdoctoral Scholar, California Institute of Technology, with Tim Colonius
- (2019) Visiting Researcher, Massachusetts Institute of Technology, with Themis Sapsis
- (2017–8) Postdoctor Researcher, XPACC, with Carlos Pantano, Dan Bodony, Jon Freund
- (2013–7) Graduate Research Fellow, University of Illinois at Urbana–Champaign, with Jon Freund
- (2012–3) Undergraduate Research Assistant, University of Michigan–Dearborn, with Eric Ratts

4 Teaching

- (2015) Fundamentals of Fluid Dynamics, University of Illinois at Urbana–Champaign
- (2013) Design and Analysis of Machine Elements, University of Michigan–Dearborn
- (2012) Probability, Statistics, and Reliability in Design, University of Michigan–Dearborn
- (2012) Statics and Mechanics of Materials, University of Michigan–Dearborn

5 Students

5.1 Current

- Jean-Sebastien Spratt, California Institute of Technology
- Ben Stevens, California Institute of Technology
- Qifan Wang, California Institute of Technology
- Alexis Charalampopoulos, Massachusetts Institute of Technology
- Esteban Cisneros, University of Illinois at Urbana–Champaign

5.2 Past

- David Mittelstein, California Institute of Technology, Ph.D. (2020)
- Theresa Trummler, TU Munich, Ph.D. (2020)
- Franz O'Meally, Johns Hopkins University, B.S. (2020)

6 Awards

- (2017) Stanley Weiss Outstanding Dissertation Award, University of Illinois at Urbana–Champaign
- (2016) Hassan Aref Award (research in fluid mechanics), University of Illinois at Urbana–Champaign
- (2015) Alumni Teaching Fellowship, University of Illinois at Urbana–Champaign
- (2010–2013) Dean's List, University of Michigan–Dearborn
- (2011) Pi Tau Sigma (honor society, member), University of Michigan–Dearborn

7 Grants

7.1 Funded grants

- (2019-20) co-PI: XSEDE CTS120005, $1.35M dollar valuation, 9M CPU Hours

7.2 Grants supported

- (2019-21) NIH 2P01-DK04881, with T. Colonius
- (2018-21) ONR MURI N0014-17-1-2676, with T. Colonius
- (2018-21) ONR BRC N0014-17-1-2625, with T. Colonius
- (2017-18) DOE PSAAP DE-NA0002374, with J. B. Freund and W. Gropp
- (2013-17) NSF CBET 13-36972, with J. B. Freund

8 Professional activity

8.1 Referee

- AIAA Journal
- Fluids
- International Journal of Multiphase Flow
- Journal of Fluid Mechanics
- Journal of Computational Physics
- Theoretical and Computational Fluid Dynamics

8.2 Affiliations

- American Physical Society
- Society of Industrial and Applied Mathematics

8.3 Service

- (2021) Organizer, Mini-symposium, "Machine learning for multiphase flows", IACM Conference on Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology
- (2015-16) Judge, Illinois State-wide Math Competition
- (2014) Organizer, Science Night, Illinois Middle Schools

9 Publications

9.1 Preprints

[P1] Spratt, J.-S., Rodriguez, M., Schmidmayer, K., **Bryngelson, S. H.**, Yang, J., Franck, C., Colonius, T., "Characterizing viscoelastic materials via ensemble-based data assimilation of bubble collapse observations". arXiv:2008.04410.

9.2 Journal papers

[J13] **Bryngelson, S. H.**, Charalampopoulos, A., Sapsis, T. P., Colonius, T., (2020). "A Gaussian moment method and its augmentation via LSTM recurrent neural networks for the statistics of cavitating bubble populations". *International Journal of Multiphase Flow* **127**, 103262.

[J12] **Bryngelson, S. H.**, Colonius, T., (2020). "Simulation of humpback whale bubble-net feeding models". *Journal of the Acoustical Society of America* **147** 2, 1126–1135.

[J11] **Bryngelson, S. H.**, Colonius, T., Fox, R. O., (2020). "QBMMlib: A library of quadrature-based moment methods". *SoftwareX* **12**, 100615.

[J10] **Bryngelson, S. H.**, Schmidmayer, K., Coralic, V., Maeda, K., Meng, J., Colonius, T., (2020). "MFC: An open-source high-order multi-component, multi-phase, and multi-scale compressible flow solver". *Computer Physics Communications*, 107396.

[J9] Schmidmayer, K., **Bryngelson, S. H.**, Colonius, T., (2020). "An assessment of multicomponent flow models and interface capturing schemes for spherical bubble dynamics". *Journal of Computational Physics* **402**, 109080.

[J8] Trummler, T., **Bryngelson, S. H.**, Schmidmayer, K., Schmidt, S. J., Colonius, T., Adams, N. A., (2020). "Near-surface dynamics of a gas bubble collapsing above a crevice". *Journal of Fluid Mechanics* **899**.

[J7] **Bryngelson, S. H.**, Freund, J. B., (2019). "Non-modal Floquet stability of a capsule in large amplitude oscillatory extension". *European Journal of Mechanics B* **77**, 171–176.

[J6] **Bryngelson, S. H.**, Guéniat, F., Freund, J. B., (2019). "Irregular dynamics of cellular blood flow in a model microvessel". *Physical Review E* **100**, 012203.

[J5] **Bryngelson, S. H.**, Schmidmayer, K., Colonius, T., (2019). "A quantitative comparison of phase-averaged models for bubbly, cavitating flows". *International Journal of Multiphase Flow* **115**, 137–143.

[J4] **Bryngelson, S. H.**, Freund, J. B., (2018). "Floquet stability analysis of capsules in viscous shear flow". *Joural of Fluid Mechanics* **852**, 663–677.

[J3] **Bryngelson, S. H.**, Freund, J. B., (2018). "Global stability of flowing red blood cell trains". *Physical Review Fluids* **3** 7, 073101.

[J2] **Bryngelson, S. H.**, Freund, J. B., (2016). "Buckling and its effect on the confined flow of a model capsule suspension". *Rheologica Acta* **55** 6, 451–464.

[J1] **Bryngelson, S. H.**, Freund, J. B., (2016). "Capsule-train stability". *Physical Review Fluids* **1** 3, 033201.

9.3 Refereed proceedings

[C7] **Bryngelson, S. H.**, Fox, R., Colonius, T., (2021). "Conditional moment method for fully-coupled phase-averaged cavitation models". *11th International Symposium on Cavitation*. Daejeon, Korea.

[C6] Rodriguez, M., **Bryngelson, S. H.**, Cao, S., Colonius, T., (2021). "Acoustically-induced bubble growth and phase change dynamics near compliant surfaces". *11th International Symposium on Cavitation*. Daejeon, Korea.

[C5] Spratt, J.-S., Rodriguez, M., **Bryngelson, S. H.**, Cao, S., Colonius, T., (2021). "Eulerian framework for bubble-cloud-kidney stone interaction". *11th International Symposium on Cavitation*. Daejeon, Korea.

[C4] **Bryngelson, S. H.**, Colonius, T., (2020). "Phase- and mixture-averaged techniques for general bubbly flows". *33rd Symposium on Naval Hydrodynamics*. Osaka, Japan.

[C3] **Bryngelson, S. H.**, Colonius, T., (2019). "A comparison of ensemble- and volume-averaged bubbly flow models". *10th International Conference on Multiphase Flow*. Rio de Janeiro, Brazil.

[C2] **Bryngelson, S. H.**, Freund, J. B., (2016). "Buckling and the rheology of an elastic capsule suspension". *XXIV International Congress of Theoretical and Applied Mechanics*. Montreal, Canada.

[C1] Freund, J. B., **Bryngelson, S. H.,** (2016). "The stability of flowing trains of confined red blood cells". *XXIV International Congress of Theoretical and Applied Mechanics*. Montreal, Canada.

9.4 Other publications

[O2] **Bryngelson, S. H.**, Pantano, C., Bodony, D., Freund, J. B., (2018). *Adjoint-based sensitivity for flows with shocks*. Tech. Report, XPACC.

[O1] **Bryngelson, S. H.** (2017). "Stability and transition of capsule-flow systems". Ph.D. Thesis. University of Illinois at Urbana–Champaign.

10 Talks

10.1 Invited talks

[I15] **Bryngelson, S. H.** (2021). *University of California, San Diego*. Fluid Mechanics, Combustion, & Engineering Physics Seminar Series.

[I14] **Bryngelson, S. H.** (2021). *California Institute of Technology*. Mechanical and Civil Engineering Seminar Series.

[I13] **Bryngelson, S. H.** (2020). *Georgia Institute of Technology*. Computational Science & Engineering Seminar Series.

[I12] **Bryngelson, S. H.** (2019). *University of Washington*. Mechanical Engineering Seminar Series.

[I11] **Bryngelson, S. H.** (2019). *University of Michigan-Ann Arbor*. Mechanical Engineering Seminar Series.

[I10] **Bryngelson, S. H.** (2019). *Massachusetts Institute of Technology*. Mechanical Engineering.

[I9] **Bryngelson, S. H.** (2019). *University of Vermont*. Mechanical Engineering Seminar Series.

[I8] **Bryngelson, S. H.** (2019). *University of Utah*. Mechanical Engineering Seminar Series.

[I7] **Bryngelson, S. H.** (2019). *University of Michigan-Dearborn*. Mechanical Engineering Seminar Series.

[I6] **Bryngelson, S. H.** (2018). *California Institute of Technology*. Flow Mechanics Research Conference.

[I5] **Bryngelson, S. H.** (2018). *California Institute of Technology*. Computational Flow Physics Group.

[I4] **Bryngelson, S. H.** (2017). *ETH Zurich*. Computational Science & Engineering Lab.

[I3] **Bryngelson, S. H.** (2017). *University of Illinois at Urbana-Champaign*. Fluid Mechanics Seminar.

[I2] **Bryngelson, S. H.** (2015). *University of Illinois at Urbana-Champaign*. Biology Interest Group.

10.2 Conference talks

[T14] **Bryngelson, S. H.**, Colonius, T., (2021). "A fast-integration-based model for polydisperse bubble cloud dynamics and their two-way-flow coupling". *Journal of the Acoustical Society of America*.

[T13] **Bryngelson, S. H.**, Fox, R., Colonius, T., (2020). "Conditioned quadrature moment methods for cavitating bubble dispersions". *American Physical Society*.

[T12] Rodriguez, M., **Bryngelson, S. H.**, Colonius, T., (2020). "Cavitation bubble growth with phase transition near a rigid wall". *American Physical Society*.

[T11] Spratt, J.-S., Rodriguez, M., **Bryngelson, S. H.**, Colonius, T., (2020). "A fully Eulerian simulation framework for cavitating bubble-clouds near viscoelastic materials". *American Physical Society.*

[T10] **Bryngelson, S. H.**, Charalampopoulos, A., Sapsis, T. P., Colonius, T., (2019). "Neural-network-augmented Gaussian moment method for the statistics of cavitating bubble populations". *American Physical Society.*

[T9] **Bryngelson, S. H.**, Colonius, T., (2019). "Annular and spiral bubble nets: A simulation-focused analysis of humpback whale feeding strategies". *Journal of the Acoustical Society of America, 146(4) 2771.*

[T8] **Bryngelson, S. H.**, Colonius, T., (2019). "Simulations and acoustics of humpback whale bubble-net feeding". *SoCal Fluids XIII.*

[T7] Trummler, T., Schmidmayer, K., **Bryngelson, S. H.**, Colonius, T., (2019). "Simulations of a collapsing gas bubble above a crevice". *SoCal Fluids XIII.*

[T6] **Bryngelson, S. H.**, Colonius, T., (2018). "Modeling approaches for bubbly, cavitating flows". *American Physical Society.*

[T5] **Bryngelson, S. H.**, Freund, J. B., (2017). "Floquet stability of tank-treading and tumbling capsules in viscous shear flow". *American Physical Society.*

[T4] **Bryngelson, S. H.**, Freund, J. B., (2017). "Global stability of fully coupled capsule flow systems". *SIAM Computational Science and Engineering.*

[T3] **Bryngelson, S. H.**, Freund, J. B., (2017). "Stability of flowing red blood cell trains". *Blood Flow.*

[T2] **Bryngelson, S. H.**, Freund, J. B., (2016). "Stability and transition to chaos of regular capsule trains". *American Physical Society.*

[T1] **Bryngelson, S. H.**, Freund, J. B., (2015). "Buckling and its effect on the confined flow of a capsule suspension". *American Physical Society.*

11 Software developed

[S5] **Bryngelson, S. H.**, Cisneros-Garibay, E., Wang, Q., Fox, R. O., Colonius, T., (2020). *PyQBMMlib: A library of quadrature-based moment methods.* URL: https://github.com/sbryngelson/PyQBMMlib.

[S4] **Bryngelson, S. H.**, Fox, R. O., Colonius, T., (2020). *QBMMlib: A library of quadrature-based moment methods.* URL: https://github.com/sbryngelson/QBMMlib.

[S3] **Bryngelson, S. H.**, Rodriguez, M., Spratt, J.-S., Schmidmayer, K., Coralic, V., Maeda, K., Meng, J., Colonius, T., (2019). *MFC: Multi-component Flow Code.* URL: https://mfc-caltech.github.edu.

[S2] Schmidmayer, K., Dorschner, B., Daniel, E., Martelot, S. L., **Bryngelson, S. H.**, Petitpas, F., (2019). *ECOGEN: Multiphase and capillary flow solver.* URL: https://code-mphi.github.io/ECOGEN/.

[S1] Campbell, M., Cisneros, E., **Bryngelson, S. H.**, Buchta, D., Anderson, M., Diener, M., Smith, M., (2018). *PlasCom2: Multi-physics turbulent flows.* URL: https://xpacc-dev.bitbucket.io/PlasCom2/.