Ismail Hameduddin

Education	The Johns Hopkins University, Baltimore, Maryland Ph.D., Mechanical Engineering, 05/2018 *Tackling viscoelastic turbulence* Readers: Dennice F. Gayme, Tamer A. Zaki & Charles Meneveau
	The Johns Hopkins University, Baltimore, Maryland M.S., Mechanical Engineering, 05/2015
	University of Missouri, Columbia, Missouri B.S., Mechanical Engineering, 12/2009
	Manarat International School, Jeddah, Kingdom of Saudi Arabia Cambridge A-levels, 05/2006 Cambridge IGCSE, 05/2004

Honours & Awards

Shark Tank Teaching Award
The Johns Hopkins University, 2016
Teaching innovation award for best submitted proposals that would enhance instruction at the university. This particular award was for a proposal to enhance the mathematical training of engineering undergraduates by establishing connections between abstract concepts and concrete applications.

Jay D. Samstag Doctoral Fellowship
The Johns Hopkins University, 2012
One of fifteen merit-based engineering-wide named fellowships for doctoral students at the university.

Departmental Fellowship
The Johns Hopkins University, 2012

Heritage scholarship
University of Missouri, 2006

Journal Papers (Turbulence)

1. **Hameduddin, I.**, Meneveau, C., Zaki, T. A. & Gayme, D. F. 2018 'Geometric decomposition of the conformation tensor in viscoelastic turbulence', *J. Fluid Mech.*, vol. 842, pp. 395–427. DOI: 10.1017/jfm.2018.118. arXiv:1803.07619 [physics.flu-dyn].

   Formulated a physically consistent approach to separate the mean and fluctuating components of the conformation tensor, and developed rigorous scalar measures to quantify the turbulent fluctuations in the polymer deformation.

2. **Hameduddin, I.**, Gayme, D. F., & Zaki, T. A. 2018 'Perturbative expansions of the conformation tensor in viscoelastic flows', *J. Fluid Mech.*, (under review).

   Formulated the theoretical, geometric basis of linearised and weakly nonlinear analysis of viscoelastic flows and used this framework to characterise the nonlinear evolution of viscoelastic Tollmien-Schlichting waves via DNS.

3. **Hameduddin, I.**, Zaki, T. A., & Gayme, D. F. 2018 'Scaling of energy amplification in viscoelastic channel flow'. arXiv:1612.06830 [physics.flu-dyn].

   Mathematically proved that the Weissenberg dependence of the amplification of stochastic noise in viscoelastic channel/Couette flows at high elasticity is analogous to the Reynolds number dependence at low elasticity, and also derived relevant elastic/viscous corrections.

Journal Papers (Control)

1. **Hameduddin, I.** & Bajodah, A. H. 2012 'Nonlinear generalised dynamic inversion for aircraft manoeuvring control', *Int. J. Control*, vol. 85, no. 4, pp. 437–450. DOI: 10.1080/00207179.2012.656143.

   Solved the singularity problem encountered in some control strategies based on the generalised inverse.

Conferences & Symposia	1. **Hameduddin, I.**, Meneveau C., Zaki, T. A. & Gayme, D. F. 2017 'Quantifying polymer deformation in viscoelastic turbulence: the geometric decomposition and a Riemannian approach to scalar measures', *70th Ann. APS–DFD Meeting*. Denver, CO.

1. **Hameduddin, I.**, Meneveau C., Zaki, T. A. & Gayme, D. F. 2017 'Quantifying polymer deformation in viscoelastic turbulence: the geometric decomposition and a Riemannian approach to scalar measures', *70th Ann. APS–DFD Meeting*. Denver, CO.

2. **Hameduddin, I.**, Meneveau C., Zaki, T. A. & Gayme, D. F. 2017 'A new approach to characterising the conformation tensor in viscoelastic turbulence', *89th Ann. SOR Meeting*. Denver, CO.

3. **Hameduddin, I.** & Gayme, D. F. 2016 'A scale-by-scale linear analysis of convective velocities and Taylor's hypothesis in turbulent channel flows', *69th Ann. APS–DFD Meeting*. Portland, OR.

4. **Hameduddin, I.** 2016 'Scaling of energy amplification in the weak and strong elastic limits of viscoelastic shear flows', *Joint Burgers–CEAFM–GWU Research Symposium on Environmental and Applied Fluid Dynamics*. Baltimore, MD.

5. **Hameduddin, I.** & Gayme, D. F. 2015 'Scaling of energy amplification in the weak and strong elastic limits of viscoelastic shear flows', *68th Ann. APS–DFD Meeting*. Boston, MA.

6. **Hameduddin, I.** & Bajodah, A. H. 2012 'Generalized dynamic inversion control for aircraft constrained trajectory tracking applications', *Proc. Am. Control Conf.*. Montreal, QC, pp. 4599–4606. DOI: 10.1109/ACC.2012.6315650.

7. **Hameduddin, I.** & Bajodah, A. H. 2011 'Generalized dynamic inversion for multiaxial nonlinear flight control', *Proc. Am. Control Conf.*. San Francisco, CA, pp. 250–255. DOI: 10.1109/ACC.2011.5991290.

Invited Talks

1. "The theoretical approach in viscoelastic turbulence", University of Pennsylvania, Philadelphia, PA, February 21st, 2018.

2. "Tackling viscoelastic turbulence", CMET seminar series, University of Delware, Newark, DE, January 9th, 2018.

Workshops & Programs

Recurrent Flows: The Clockwork Behind Turbulence
Kavli Institute for Theoretical Physics
University of California, Santa Barbara, California
01/03/2017 − 02/10/2017

Teaching

Teaching Assistant
EN.530.761: Mathematical Methods of Engineering I, Fall 2016
The Johns Hopkins University, Baltimore, Maryland
First graduate level mathematics course in the mechanical engineering department taught by Prof. Dennice F. Gayme. I designed and graded homeworks, held office hours, and gave lectures on matrix theory (in the context of first-order ordinary differential equations), and Fourier analysis.
Class size: 34. Combined student rating for both course teaching assistants: 3.28/5.00 (mean), 1.57 (standard deviation), 4.00/5.00 (median), 96.97% students reporting.

Teaching Assistant
EN.530.726: Hydrodynamic Stability, Fall 2014
The Johns Hopkins University, Baltimore, Maryland
Graduate level mechanical engineering course taught by Prof. Tamer A. Zaki. I designed and graded homeworks, held office hours, and gave lectures on Lyapunov stability theory for nonlinear systems.
Class size: 20. Student rating: 4.36/5.00 (mean), 0.84 (standard deviation), 4.50/5.00 (median), 100% students reporting.

Teaching Assistant
EN.530.327: Introduction to Fluid Mechanics, Fall 2013
The Johns Hopkins University, Baltimore, Maryland
Introductory course for mechanical engineering undergraduates taught by Prof. Dennice F. Gayme. I helped design and grade homeworks and exams. I also held office hours and review sessions to assist the students.
Class size: 61. Combined student rating for both course teaching assistants: 3.31/5.00 (mean), 1.23 (standard deviation), 3.00/5.00 (median), 96.72% students reporting.

Service	- Graduate student panel member, External Departmental Review Committee at the Johns Hopkins University, 2014–2016.
	- Treasurer, Mechanical Engineering Graduate Association (MEGA) at the Johns Hopkins University, 2013–2015.
	- Mentor, STEM Achievement in Baltimore Elementary Schools (SABES), Baltimore, MD, 2013–2014.

Professional

Research Assistant
The Johns Hopkins University, Baltimore, Maryland
08/2013 − Present
Working with Prof. Dennice Gayme on turbulence in Newtonian and non-Newtonian flows.

Research Assistant
King Abdullah University of Science & Technology (KAUST), Thuwal, Kingdom of Saudi Arabia
01/2012 − 08/2012
Worked with Prof. Christian Claudel on control of Burgers and Lighthill–Whitham–Richards (LWR) equations using Lax–Hopf solutions, boundary actuators and mixed-integer linear programming.

Research Engineer
King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia
02/2010 − 05/2011
Developed a control lab for training engineering undergraduates and worked with Prof. Abdulrahman Bajodah, developing the generalised dynamic inversion (GDI) approach to control. I also helped teach courses on linear systems theory (graduate) and flight dynamics (undergraduate).

References

Professor Tamer A. Zaki
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Professor Charles Meneveau
The Johns Hopkins University, Baltimore, Maryland
Email: meneveau@jhu.edu
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