

Christopher M. Boyce
Columbia University
The Fu Foundation School of Engineering and Applied Science
Department of Chemical Engineering

A. Field of Specialization

Academic Specialization: Chemical Engineering
Research Specialization: Multiphase Flows, Granular Flows

B. Education

- B.S., Massachusetts Institute of Technology, Chemical Engineering and Physics, 2011
- Ph.D., University of Cambridge, Chemical Engineering, 2015
Dissertation: “Fundamental Studies of the Physics of Gas-Solid Fluidization”
Sponsor: Dr. John Dennis

C. Positions Held Since Bachelor’s Degree was Conferred

- Assistant Professor of Chemical Engineering, Columbia University. (Jan. 2018-Present)
- Postdoctoral Researcher, ETH Zurich. (Jan. 2017-Dec. 2017)
- Postdoctoral Researcher, Princeton University. (Jan. 2015-Dec. 2016)
- Graduate Research Assistant, University of Cambridge. (Sept. 2011-Dec. 2014)

D. Honors, Prizes and Fellowships

- NSF CAREER Award, 2022
- Invited to Present a Paper in “Futures” Issue of AIChE Journal for future leaders in Chemical Engineering, 2022
- Article Selected as Cover Article for Industrial and Engineering Chemistry Research, 2021
- Article Selected as Cover Article for Chemical Engineering Science, 2021
- Provost’s Grants Program Award for Junior Faculty Who Contribute to the Diversity Goals of the University, Columbia University, 2021
- Janette and Armen Avanesians Diversity Award, Columbia University SEAS, 2021
- Sabic Young Professional Award from the AIChE Particle Technology Forum for Outstanding Contributions to Particle Technology from an Individual Under 40, 2019
- Article Selected as Cover Article for Chemical Engineering Science, 2019
- Forbes 30 Under 30 in Science, 2019
- Invited to Present a Paper in “Futures” Issue of AIChE Journal for future leaders in Chemical Engineering, 2018
- Invited to Present a Paper based on a Best Presentation in Session at the World Congress on Particle Technology 8, 2018

- Danckwerts-Pergamon Prize for the best PhD thesis related to chemical engineering, University of Cambridge, 2015
- Gates Cambridge Scholar, 2011-2014
- 2nd Prize, third year presentation, Department of Chemical Engineering and Biotechnology, University of Cambridge, 2014
- 1st Prize, second year poster presentation, Department of Chemical Engineering and Biotechnology, University of Cambridge, 2013
- Phi Beta Kappa Academic Honor Society, MIT, 2011
- Sigma Pi Sigma Physics Honor Society, MIT, 2011
- Tau Beta Pi Engineering Honor Society, MIT, 2010

E. Grants and Contracts

Title: CAREER: Magnetic Resonance Imaging of Periodically Structured Bubbling Phenomena in Dense Suspensions and Fluidized Granular Materials

Lead PI: Chris Boyce

Source: National Science Foundation

Period of Performance: 7/2022-6/2027

Title: Particle segregation and forces on internal pipes in model particle-liquid-gas multiphase reactors

Lead PI: Chris Boyce

Source: Office of Naval Research

Period of Performance: 1/2022-12/2024

Title: Collaboration between Tuskegee University and Columbia University

Lead PIs: Chris Boyce, Mandar Kathe

Source: Sloan Foundation

Period of Performance: 12/2021-11/2023

Title: Sustainable Mining via Novel Separation of Granular Particles

Lead PIs: Chris Boyce, D.R. Nagaraj, Ray Farinato

Source: Columbia University

Period of Performance: 09/2021-08/2022

Title: Summer Research Experience in Chemical Engineering at Columbia University for Underrepresented Minority Undergraduates from Tuskegee University: Multiphase Flows

Lead PI: Chris Boyce

Source: Columbia University

Period of Performance: 05/2021-08/2021

Title: Magnetic Resonance Imaging and Modeling of Gas and Particle Flow in Fluidized Beds

Lead PI: Chris Boyce

Source: National Science Foundation

Period of Performance: 11/2020-10/2023

Title: Take a look inside – Magnetic Resonance Imaging of magma analogues to study volcanic eruptions

Lead PIs: Chris Boyce and Einat Lev

Source: Columbia University

Period of Performance: 09/2020-08/2022

Title: REU Site: ChemE-NYC: Climate and Health Solutions

Lead PI: Chris Boyce

Source: National Science Foundation

Period of Performance: 4/2022-3/2025

F. Publications

Publication Statistics (Retrieved from Chris Boyce's [Google Scholar](#) Page 2/6/2022):

Publications: 45 total, 32 corresponding author, 11 last author

Total citations: 1165

h-index: 19

i10-index: 29

Peer-Reviewed Journal Publications:

Note on Authorship Convention in the Field: The first author is typically a student or postdoctoral researcher who conducted the most experimental, theoretical or numerical work for the paper. The last author is typically the senior researcher primarily advising the research.

Note: Names of students and postdoctoral researchers from the candidate's group are underlined. The candidate's name is **bolded**. Corresponding author is marked with *. IF stands for Impact Factor

#	Title
48)	<u>Guo, Q.</u> ; <u>Zhang, Y.</u> ; <u>Kovar, T. M.</u> ; <u>Xi, K.</u> ; Boyce, C. M. A Rayleigh-Bénard Convection Instability Analog in Vibrated Gas-Fluidized Granular Particles. <i>Soft Matter</i> 2022 , Accepted. Link
47)	<u>Guo, Q.</u> ; <u>Zhang, Y.</u> ; <u>Vazquez, C.</u> ; <u>Xi, K.</u> ; Boyce, C. M. Multi-Fluid Model Simulations of Gravitational Instabilities in Fluidized Binary Granular Materials. <i>AIChE J.</i> 2022 , e17714. Link
46)	<u>Guo, Q.</u> ; Boyce, C. M. Structured Bubbling in Layered Gas-Fluidized Beds Subject to Vibration: A CFD-DEM Study. <i>AIChE J.</i> 2022 , e17709. Link
45)	Metzger, J. P.; McLaren, C. P.; Pinzello, S.; Conzelmann, N. A.; Boyce, C. M. ; Müller, C. R.* Sinking Dynamics and Splitting of a Granular Droplet. <i>Phys. Rev. Fluids</i> 2022 , 7 (1), 014309. IF = 2.5 Link

- 44) Padash, A.; Chen, B.; **Boyce, C. M.*** Characterizing Alternating Bubbles Emerging from Two Interacting Vertical Gas Jets in a Liquid. *Chem. Eng. Sci.* **2022**, 117199. IF = 4.3 [Link](#)
- 43) Guo, Q.; Zhang, Y.; Padash, A.; Xi, K.; Kovar, T. M.; **Boyce, C. M.*** Dynamically Structured Bubbling in Vibrated Gas-Fluidized Granular Materials. *Proc. Natl. Acad. Sci.* **2021**, 118 (35). IF = 11.2 [Link](#) (Featured in [Scientific American](#))
- 42) Guo, Q.; Bordbar, A.; Ma, L.; Yu, Y.; Xu, S.; **Boyce, C. M.***; Ye, M.* A CFD-DEM Study of the Solid-like and Fluid-like States in the Homogeneous Fluidization Regime of Geldart A Particles. *AIChE J.* **2021**, e17420. IF = 4.0 [Link](#)
- 41) Xi, K.; Guo, Q.; **Boyce, C. M.**; Lu, Y.* Contact-Based Method to Evaluate Mixing in Multicomponent Experiments and Simulations. *Ind. Eng. Chem. Res.* **2021**, 60 (44), 16126–16142. IF = 3.7 [Link](#)
- 40) Xi, K.; Guo, Q.; **Boyce, C. M.*** Comparison of CFD-DEM and TFM Simulations of Single Bubble Injection in 3D Gas-Fluidized Beds with MRI Results. *Chem. Eng. Sci.* **2021**, 243, 116738. IF = 4.3 [Link](#)
- 39) Xi, K.; Kovar, T.; Fullmer, W. D.; Penn, A.; Musser, J.; **Boyce, C. M.*** CFD-DEM Study of Bubble Properties in a Cylindrical Fluidized Bed of Geldart Group D Particles and Comparison with Prior MRI Data. *Powder Technol.* **2021**, 389, 75–84. IF = 5.1 [Link](#)
- 38) Xi, K.; Guo, Q.; **Boyce, C. M.*** Comparison of Two-Fluid Model Simulations of Freely Bubbling Three-Dimensional Gas-Fluidized Beds with Magnetic Resonance Imaging Results. *Ind. Eng. Chem. Res.* **2021**, 60 (19), 7429–7442. IF = 3.7 [Link](#) ([Journal Cover Image](#))
- 37) McLaren, C. P.; Metzger, J. P.; **Boyce, C. M.***; Müller, C. R.* Reduction in Minimum Fluidization Velocity and Minimum Bubbling Velocity in Gas-Solid Fluidized Beds Due to Vibration. *Powder Technol.* **2021**, 382, 566–572. IF = 5.1 [Link](#)
- 36) Guo, Q.; Padash, A.; **Boyce, C. M.*** A Two Fluid Modeling Study of Bubble Collapse Due to Bubble Interaction in a Fluidized Bed. *Chem. Eng. Sci.* **2021**, 232, 116377. IF = 4.3 [Link](#) ([Journal Cover Image](#))
- 35) Lev, E.*; **Boyce, C. M.*** Opportunities for Characterizing Geological Flows Using Magnetic Resonance Imaging. *iScience* **2020**, 23 (9). [Link](#)
- 34) Penn, A.; Padash, A.; Lehnert, M.; Pruessmann, K. P.; Müller, C. R.*; **Boyce, C. M.*** Asynchronous Bubble Pinch-off Pattern Arising in Fluidized Beds Due to Jet Interaction: A Magnetic Resonance Imaging and Computational Modeling Study. *Phys. Rev. Fluids* **2020**, 5 (9), 094303. IF = 2.5 [Link](#)
- 33) Padash, A.; **Boyce, C. M.*** Collapse of a Bubble Injected Side-by-Side with Another Bubble into an Incipiently Fluidized Bed: A CFD-DEM Study. *Phys. Rev. Fluids* **2020**, 5 (3), 034304. IF = 2.5 [Link](#)
- 32) Penn, A.*; **Boyce, C. M.**; Pruessmann, K. P.; Müller, C. R. Regimes of Jetting and Bubbling in a Fluidized Bed Studied Using Real-Time Magnetic Resonance Imaging. *Chem. Eng. J.* **2020**, 123185. IF = 13.3 [Link](#)

- 31) McLaren, C. P.; Kovar, T. M.; Penn, A.; Müller, C. R.*; **Boyce, C. M.*** Gravitational Instabilities in Binary Granular Materials. *Proc. Natl. Acad. Sci.* **2019**, 201820820. IF = 11.2 [Link](#) (Featured in *Gizmodo* and *Popular Mechanics*)
- 30) **Boyce, C. M.***; Penn, A.; Lehnert, M.; Pruessmann, K. P.; Müller, C. R. Characteristics of a Single Jet Injected into an Incipiently Fluidized Bed: A Magnetic Resonance Imaging Study. *Adv. Powder Technol.* **2019**. IF = 4.8 [Link](#)
- 29) **Boyce, C.M.***; Penn, A.; Lehnert, M.; Pruessmann, K.P.; Müller, C. R. Magnetic Resonance Imaging of Interaction and Coalescence of Two Bubbles Injected Consecutively into an Incipiently Fluidized Bed. *Chem. Eng. Sci.* **2019**, 115152. IF = 4.3 [Link](#)
- 28) **Boyce, C. M.***; Penn, A.; Padash, A.; Lehnert, M.; Pruessmann, K. P.; Müller, C. R. Anomalous Collapse of Interacting Bubbles in a Fluidized Bed: A Magnetic Resonance Imaging Study. *Phys. Rev. Fluids* **2019**, 4, 034303. IF = 2.5 [Link](#)
- 27) **Boyce, C. M.***; Penn, A.; Lehnert, M.; Pruessmann, K. P.; Müller, C. R. Magnetic Resonance Imaging of Single Bubbles Injected into Incipiently Fluidized Beds. *Chem. Eng. Sci.* **2019**, 200, 147–166. IF = 4.3 [Link](#)
- 26) **Boyce, C. M.***; Penn, A.; Lehnert, M.; Pruessmann, K. P.; Müller, C. R. Wake Volume of Injected Bubbles in Fluidized Beds: A Magnetic Resonance Imaging Velocimetry Study. *Powder Technol.* **2019**. (Invited). IF = 5.1 [Link](#)
- 25) Penn, A.*; **Boyce, C. M.**; Conzelmann, N.; Bezing, G.; Pruessmann, K. P.; Müller, C. R.* Real-Time Magnetic Resonance Imaging of Fluidized Beds with Internals. *Chem. Eng. Sci.* **2019**, 198, 117–123. IF = 4.3 [Link](#) (Journal Cover Image)
- 24) **Boyce, C. M.***; Penn, A.; Lehnert, M.; Pruessmann, K. P.; Müller, C. R. Effect of Liquid Bridging on Bubbles Injected into a Fluidized Bed: A Magnetic Resonance Imaging Study. *Powder Technol.* **2019**, 343, 813–820. IF = 5.1 [Link](#)
- 23) **Boyce, C. M.*** Gas-Solid Fluidization with Liquid Bridging: A Review from a Modeling Perspective. *Powder Technol.* **2018**, 336, 12–29. IF = 5.1 [Link](#)
- 22) Penn, A.*; **Boyce, C. M.***; Kovar, T.; Tsuji, T.; Pruessmann, K. P.; Müller, C. R. * Real-Time Magnetic Resonance Imaging of Bubble Behavior and Particle Velocity in Fluidized Beds. *Ind. Eng. Chem. Res.* **2018**, 57 (29), 9674–9682 (Invited). [Link](#)
- 21) **Boyce, C. M.***; Penn, A.; Pruessmann, K. P.; Müller, C. R. Magnetic Resonance Imaging of Gas–Solid Fluidization with Liquid Bridging. *AIChE J.* **2018**, 64 (8), 2958–2971 (Invited). IF = 4.0 [Link](#)
- 20) Penn, A.; Tsuji, T.; Brunner, D. O.; **Boyce, C. M.**; Pruessmann, K. P.; Müller, C. R. * Real-Time Probing of Granular Dynamics with Magnetic Resonance. *Science Advances* **2017**, 3 (9), e1701879. IF = 14.1 [Link](#)
- 19) Kolehmainen, J.*; Sippola, P.; Raitanen, O.; Ozel, A.; **Boyce, C. M.**; Saarenrinne, P.; Sundaresan, S. Effect of Humidity on Triboelectric Charging in a Vertically Vibrated Granular Bed: Experiments and Modeling. *Chem. Eng. Sci.* **2017**, 173, 363–373. IF = 4.3 [Link](#)
- 18) **Boyce, C. M.***; Ozel, A.; Kolehmainen, J.; Sundaresan, S.; McKnight, C. A.; Wormsbecker, M. Growth and Breakup of a Wet Agglomerate in a Dry Gas–solid

- Fluidized Bed. *AIChE J.* **2017**, *63* (7), 2520–2527. IF = 4.0 [Link](#)
- 17) **Boyce, C. M.***; Ozel, A.; Kolehmainen, J.; Sundaresan, S. Analysis of the Effect of Small Amounts of Liquid on Gas–Solid Fluidization Using CFD-DEM Simulations. *AIChE J.* **2017**, *63* (12), 5290–5302. IF = 4.0 [Link](#)
 - 16) **Boyce, C. M.***; Ozel, A.; Rice, N. P.; Rubinstein, G. J.; Holland, D. J.; Sundaresan, S. Effective Particle Diameters for Simulating Fluidization of Non-Spherical Particles: CFD-DEM Models vs. MRI Measurements. *AIChE J.* **2017**, *63* (7), 2555–2568. IF = 4.0 [Link](#)
 - 15) Kolehmainen, J.*; Ozel, A.; **Boyce, C. M.**; Sundaresan, S. Triboelectric Charging of Monodisperse Particles in Fluidized Beds. *AIChE J.* **2017**, *63* (6), 1872–1891. IF = 4.0 [Link](#)
 - 14) **Boyce, C. M.***; Rice, N. P.; Ozel, A.; Davidson, J. F.; Sederman, A. J.; Gladden, L. F.; Sundaresan, S.; Dennis, J. S.; Holland, D. J. Magnetic Resonance Characterization of Coupled Gas and Particle Dynamics in a Bubbling Fluidized Bed. *Phys. Rev. Fluids* **2016**, *1* (7), 74201. IF = 2.5 [Link](#)
 - 13) **Boyce, C. M.***; Ozel, A.; Sundaresan, S. Intrusion of a Liquid Droplet into a Powder under Gravity. *Langmuir* **2016**, *32* (34), 8631. IF = 3.9 [Link](#)
 - 12) Kolehmainen, J.*; Ozel, A.; **Boyce, C. M.**; Sundaresan, S. A Hybrid Approach to Computing Electrostatic Forces in Fluidized Beds of Charged Particles. *AIChE J.* **2016**, *62* (7), 2282. IF = 4.0 [Link](#)
 - 11) **Boyce, C. M.***; Rice, N. P.; Davidson, J. F.; Sederman, A. J.; Dennis, J. S.; Holland, D. J. Magnetic Resonance Imaging of Gas Dynamics in the Freeboard of Fixed Beds and Bubbling Fluidized Beds. *Chem. Eng. Sci.* **2016**, *147*, 13. IF = 4.3 [Link](#)
 - 10) **Boyce, C. M.***; Rice, N. P.; Sederman, A. J.; Dennis, J. S.; Holland, D. J. 11-Interval PFG Pulse Sequence for Improved Measurement of Fast Velocities of Fluids with High Diffusivity in Systems with Short T2*. *J. Magn. Reson.* **2016**, *265*, 67. IF = 2.6 [Link](#)
 - 9) Lu, X.; **Boyce, C. M.**; Scott, S. A.; Dennis, J. S.; Holland, D. J.* Investigation of Two-Fluid Models of Fluidisation Using Magnetic Resonance and Discrete Element Simulations. *Procedia Eng.* **2015**, *102*, 1436. IF = 1.9 [Link](#)
 - 8) **Boyce, C. M.***; Holland, D. J.; Scott, S. A.; Dennis, J. S. Limitations on Fluid Grid Sizing for Using Volume-Averaged Fluid Equations in Discrete Element Models of Fluidized Beds. *Ind. Eng. Chem. Res.* **2015**, *54* (43), 10684. IF = 3.7 [Link](#)
 - 7) Pore, M.; Ong, G. H.; **Boyce, C. M.**; Materazzi, M.; Gargiuli, J.; Leadbeater, T.; Sederman, A. J.; Dennis, J. S.*; Holland, D. J.; Ingram, A.; et al. A Comparison of Magnetic Resonance, X-Ray and Positron Emission Particle Tracking Measurements of a Single Jet of Gas Entering a Bed of Particles. *Chem. Eng. Sci.* **2015**, *122*, 210. IF = 4.3 [Link](#)
 - 6) **Boyce, C. M.***; Davidson, J. F.; Holland, D. J.; Scott, S. A.; Dennis, J. S. The Origin of Pressure Oscillations in Slugging Fluidized Beds: Comparison of Experimental Results from Magnetic Resonance Imaging with a Discrete Element Model. *Chem. Eng. Sci.* **2014**, *116*, 611. IF = 4.3 [Link](#)

- 5) **Boyce, C. M.***; Holland, D. J.; Scott, S. A.; Dennis, J. S. Novel Fluid Grid and Voidage Calculation Techniques for a Discrete Element Model of a 3D Cylindrical Fluidized Bed. *Comput. Chem. Eng.* **2014**, *65*, 18. IF = 3.8 [Link](#)
- 4) Harper, R. N.; **Boyce, C. M.**; Scott, S. A.* Oxygen Carrier Dispersion in Inert Packed Beds to Improve Performance in Chemical Looping Combustion. *Chem. Eng. J.* **2013**, *234*, 464. IF = 13.3 [Link](#)
- 3) **Boyce, C. M.***; Holland, D. J.; Scott, S. A.; Dennis, J. S. Adapting Data Processing To Compare Model and Experiment Accurately: A Discrete Element Model and Magnetic Resonance Measurements of a 3D Cylindrical Fluidized Bed. *Ind. Eng. Chem. Res.* **2013**, *52* (50), 18085. IF = 3.7 [Link](#)
- 2) Taylor, R. E.; **Boyce, C. M.**; Boyce, M. C.; Pruitt, B. L.* Planar Patterned Stretchable Electrode Arrays Based on Flexible Printed Circuits. *J. Micromechanics Microengineering* **2013**, *23* (10), 105004. IF = 1.9 [Link](#)
- 1) Barr, M. C.; Rowehl, J. A.; Lunt, R. R.; Xu, J.; Wang, A.; **Boyce, C. M.**; Im, S. G.; Bulović, V.*; Gleason, K. K.* Direct Monolithic Integration of Organic Photovoltaic Circuits on Unmodified Paper. *Adv. Mater.* **2011**, *23* (31), 3500. IF = 30.9 [Link](#)

G. Patents

Title

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- 3) **Boyce, C.M.**, Socrate, S., Greviskes, B.P., Boyce, M.C. “Structured materials with tailored isotropic and anisotropic poisson’s ratios including zero and negative poisson’s ratios” (Application 2011, full patent not pursued)
 - 2) Taylor, R.E., Pruitt, B.L., Boyce, M.C., **Boyce, C.M.**, “In-plane-strain-actuated out-of-plane actuator”, U.S. Utility Patent 10150665 (Application 2014, Granted 2018).
 - 1) Boyce, M.C., Socrate, S., **Boyce, C.M.** and Greviskes, B., “Structured material substrates for flexible, stretchable electronics”, U.S. Utility Patent 8,883,287 (Application 2010, Granted 2014).

H. Teaching Experience

Courses Taught

CHEN E3110, Transport Phenomena I. (2018-Present)

CHEN E4150, Computational Fluid Dynamics in Chemical Engineering. (2018-Present)

CHEN E9000, Chemical Engineering Colloquium. (2020-2021)

CHEN E9500, Doctoral Research. (2018-Present)

CHEN E9400, Masters Research. (2018-Present)

CHEN E3900, Undergraduate Research Project. (2018-Present)

Experience as a Thesis Sponsor and Committee Member for Student Research

Doctoral Students (Sponsored):

1. **Azin Padash** (Sept. 2018-Nov. 2021; defended thesis Nov. 2021)
Thesis Title: *Bubble Rise Dynamics in Complex Fluids*
2. **Jagan Mohan Sanghishetty** (Sept. 2019-Present)
Thesis Area: *Granular Separations for Sustainable Mining using Vibrated Gas-Fluidized Beds*
3. **Alireza Bordbar** (Jan. 2020-Present)
Thesis Area: *Magnetic Resonance Imaging of the Flow of Granular Suspensions*
4. **Christopher Spitler** (Jan. 2022-Present)
Thesis Area: *Controlling Wetted Granular Flows for Aluminum-Water Reactors*
5. **Javad Omid** (Jan. 2022-Present)
Thesis Area: *Characterizing Periodically Repeating Bubble Patterns in Complex Fluids*

Doctoral Students (Reader and Committee Member):

1. Chen Yong, ETH Zurich, Mechanical and Process Engineering, 2017
2. Jonathan Davis, Columbia University, Chemical Engineering, 2019
3. Richa Batra, Columbia University, Mechanical Engineering, 2019

Undergraduate Students (Sponsored Senior Thesis):

1. Carolina Vazquez (2021, Pursuing a Master's at University of Michigan)
2. Yuxuan Zhang (2022, Pursuing a Master's at EPFL starting Fall 2022)
3. Shawn Chiu (2022, Pursuing a PhD at UCLA starting Fall 2022)

Postdoctoral Researchers Advised:

1. **Qiang Guo** (Dec. 2019-Present)
2. **Wasif Zia** (Jul. 2020-Present)

I. Invited Talks

- 19) **Boyce, C.M.** (2022) "Structured Flow Instabilities in Granular" *Invited Seminar at Granular Matter Gordon Research Conference.*
- 18) **Boyce, C.M.** (2022) "Fluid or Not? Structured Instabilities in Excited Granular Flows" *Invited Seminar at the City College of New York.*
- 17) **Boyce, C.M.** (2021) "Structured Bubbly Flows in Particle-Laden Complex Fluids" *Invited Seminar at Rutgers University.*
- 16) **Boyce, C.M.** (2021) "Characterizing and Structuring Multiphase Granular Flows" *Invited Seminar at the University of Cambridge.*
- 15) **Boyce, C.M.** (2021) "Characterizing and Structuring Multiphase Granular Flows" *Invited Seminar at The Ohio State University.*
- 14) **Boyce, C.M.** (2021) "Characterizing and Structuring Multiphase Granular Flows" *Invited Seminar at New York University.*
- 13) **Boyce, C.M.** (2021) "Characterizing and Structuring Multiphase Granular Flows" *Invited Seminar at UC Davis.*

- 12) **Boyce, C.M.** (2020) “Characterizing and Structuring Multiphase Granular Flows” *Invited Seminar at Stevens Institute of Technology.*
- 11) **Boyce, C.M.** (2020) “Characterizing and Structuring Multiphase Granular Flows” *Invited Seminar at Columbia University.*
- 10) **Boyce, C.M.** (2020) “Magnetic Resonance Imaging and Optical Imaging of Multiphase Granular Flows” *Invited Seminar at Lamont-Doherty Earth Observatory.*
- 9) **Boyce, C.M.** (2020) “Gaseous Bubbles and Granular Bubbles in Fluidized Granular Particles” *Invited Seminar at Stony Brook University.*
- 8) **Boyce, C.M.** (2020) “Phenomena in Fluidized Granular Flows” *Invited Plenary Lecture at the 12th Northeast Complex Fluids and Soft Matter Conference.*
- 7) **Boyce, C.M.** (2019) “MRI, Optical Imaging and Computational Modeling of Fluidization Phenomena” *Invited Sabic Young Professional Award Lecture at the AIChE Annual Meeting.*
- 6) **Boyce, C.M.** (2019) “MRI and Computational Modeling of Multiphase Granular Flows” *Invited Seminar at the City College of New York.*
- 5) **Boyce, C.M.** (2019) “MRI and Computational Modeling of Multiphase Granular Flows” *Invited Seminar at the U.S. Naval Undersea Warfare Center.*
- 4) **Boyce, C.M.** (2019) “Magnetic Resonance Imaging of Multiphase Granular Flows” *Invited Seminar at TU Hamburg.*
- 3) **Boyce, C.M.** (2019) “Structures and Instabilities in Multiphase Granular Flows” *Invited Seminar at the Chinese Academy of Sciences.*
- 2) **Boyce, C.M.** (2018) “MRI and Computational Modeling of Multiphase Chemical Reactors” *Invited Seminar at ExxonMobil Chemical.*
- 1) **Boyce, C.M.** (2018) “MRI and Computational Modeling of Multiphase Flows” *Invited Seminar at Pall Corporation.*

J. Service

Service to the University

- Undergraduate Committee Member, Department of Chemical Engineering, 2018-Present
 - Conducted biannual advising sessions, streamlined student course selection, evaluated senior theses, participated in various recruitment events
- Designed a new course from scratch “CHEN 4150: Computational Fluid Dynamics in Chemical Engineering”, 2018.
- Columbia-Amazon Summer Undergraduate Research Experience (SURE) Program Committee Member, SEAS, 2020-2021
 - Helped organize program, recruit students and evaluate applications
- Undergraduate Education Reform Committee Member, SEAS, 2019
 - Helped find ways to expose first year undergraduates to more forms of engineering
- Engineering Outreach Committee Member, SEAS, 2021-Present
 - Helped find new ways to improve engineering outreach
- Undergraduate Transport Committee Member, Department of Chemical Engineering, 2021-Present

- Personally combined fundamentals of transport phenomena from two semester-long courses into a single semester-long course to provide more flexibility and choice to undergraduates in their education
- Chemical Engineering Department Representative, Committee of Instruction (COI), SEAS, 2021
 - Passed changes to the undergraduate chemical engineering curriculum
- Diversity, Equity and Inclusion (DEI) Committee Member, Department of Chemical Engineering, 2022-Present
 - Conducted various efforts to improve DEI in the department, notably coordinating efforts with Tuskegee University and organizing a seminar to potentially increase the diversity of the faculty

Service to the Discipline

- **Peer Reviewer for Journals** (10-20 papers per year): *PNAS*, *Science Advances*, *PLoS ONE*, *AICHE Journal*, *Chemical Engineering Science*, *Industrial and Engineering Chemistry Research*, *Chemical Engineering Research and Design*, *Journal of Fluid Mechanics*, *Physical Review Fluids*, *Physics of Fluids*, *International Journal of Multiphase Flow*, *Powder Technology*
- **Grant Proposal Reviewer**: National Science Foundation (2 times), Army Research Office (1 time)
- Young Professional Editorial Board, *Particuology*, 2021-Present
- Editorial Advisory Board, *ACS Engineering Au*, 2021-Present
- Session Co-Chair, AIChE Annual Meeting, Powder Technology Forum, 2021
- Session Chair, AIChE Annual Meeting, Powder Technology Forum, 2022-Present
- Session Chair, Fluidization XVI Conference, 2019

Conferences and Workshops Organized

- Organized a new seminar series, “Fluids@Columbia”, for fluid mechanics research across schools and departments, 2021-Present

Outreach

- Hosted lab tours for NYC middle school students through Columbia’s Inside Engineering Program, 2019-Present
- Hosted 6 total high school students for summer laboratory research through Columbia’s Engineering the Next Generation Program, 2019-Present
- Created research videos published online with thousands of views and conducted subsequent interviews for media outlets, including features in [Scientific American](#), [Gizmodo](#) and [Popular Mechanics](#), 2019-Present

Diversity, Equity and Inclusion (DEI)

- Hosted 6 underrepresented minority (URM) high school students for summer laboratory research, 2019-Present
- Service in the formation of the Amazon-SURE summer research program for undergraduate URM students, 2020-Present
- Hosted two URM female students from Tuskegee University for summer research, 2021

- Collaboration with Historically Black Tuskegee University (TU), 2020-Present
 - Secured \$250,000 in funds from the Sloan Foundation to fund creation of biomedical engineering courses at TU, an alumnus from TU in Columbia's Bridge-to-the-PhD program, a master's student from TU to conduct collaborative research with Columbia and undergraduate research and design challenges involving Columbia and TU students
 - Applying for funds from Genentech to study this collaboration externally
 - Part of Columbia delegation to visit TU in person to further collaborations
- Organizing a National Science Foundation Research Experiences for Undergraduates (REU) Site at Columbia Chemical Engineering, 2022-Present
- Service on Chemical Engineering DEI Committee, 2022-Present