Gareth H. McKinley
School of Engineering Professor of Teaching Innovation
Department of Mechanical Engineering, MIT

Education:

Ph.D. in Chemical Engineering, Massachusetts Inst. of Technology, Cambridge, MA. 1991
M. Eng. [First Class Hon.] in Chemical Engineering, University of Cambridge, Cambridge, England. 1986
B.A. in Natural Sciences/Chemical Engineering, University of Cambridge, Cambridge, England, 1985

MIT Service:

20 years on the MIT faculty

2007-present	School of Engineering Professor of Teaching Innovation
2013	Interim Head of Mechanical Engineering, June 1 – Aug 31, 2013
2008-2013	Associate Head for Research, Department of Mechanical Engineering
2005-2008	Member of Mechanical Engineering Council & Area Head (Area 1; MMEC)
2004-2009	Director, MIT Program in Polymer Science and Technology (PPST)
2001-2008	Head, Hatsopoulos Microfluids Laboratory
2001-2005	Professor of Mechanical Engineering
1997-2001	Lord Associate Professor of Mechanical Engineering

Other Related Experience:

2017 April	IDEX Visiting Professor, Université de Bordeaux, Centre Rechere Paul Pascal (CRPP)
2015 Feb – May	Visiting Professor, Singapore University of Technology & Design
2014 April	Michelin Chair, Visiting Professor, ESPCI Paris
2002 Jan –July	Visiting Professor, Monash University & Distinguished Miegunyah Fellow, University of Melbourne, Melbourne Australia
1991-1995	Harvard University, Gordon McKay Assistant Professor of Engineering Sciences
1995-1997	Harvard University, John L. Loeb Associate Professor of the Natural Sciences
1996	Paul & Gabriella Rosenbaum Visiting Fellow, Isaac Newton Institute, U. Cambridge UK.

Scientific & Professional Societies:

Member, Society of Rheology (1991 – present)
Member, British Society of Rheology (1991 – 2008)
Associate Member, American Institute of Chemical Engineers (1991 – present)
Materials Research Society (2009-present)
American Society of Mechanical Engineers (2008-present)

Honors & Awards:

Den Hartog Outstanding Educator Award, *MIT,* June 2017
The *Gold Medal* of the *British Society of Rheology*, Dec. 2014
The *Bingham Medal* from the Society of Rheology, Oct. 2013
Bird, Stewart and Lightfoot (BSL) Lecturer, U.W.-Madison, May 2010
Elected Fellow, *American Physical Society-–Division of Fluid Dynamics*, 2007
TA Instruments/*Society of Rheology Best Paper* Award Oct. 2007
School of Engineering Professor of Teaching Innovation, 2007 – present
*Class of 1960 Fellow***,** Office of the Provost, MIT, May 2005
Frenkiel Award, APS Division of Fluid Dynamics, Nov. 2002
Miegunyah Distinguished Fellow, University of Melbourne, Jan.– June 2002
Spira Award for Undergraduate Teaching, Department of Mechanical Engineering, MIT April 2000
Bose Award for Teaching Excellence, School of Engineering, MIT May 2000
Presidential Faculty Fellow, National Science Foundation, 1995-1997.
Annual Award, British Society of Rheology, 1995.

Institutional & Professional Service (last 12 years):

Chair, Fluid Mechanics Programming Committee of Area 1j, A.I.Ch.E , 2004 – 2006
Symposium Organizer, XIIIth International Congress on Rheology; Seoul South Korea, August 2004
APS Division of Fluid Dynamics Publications Committee, Jan 2004 – Dec. 2007

Member of Technical Advisory Board for EPSRC Portfolio Partnership in Complex Fluids; Univ. of Wales, U.K., 2005-2008

Member of Executive Committee, *Society for Engineering Sciences;* June 2006 - Dec. 2008

Associate Editor, *J. Fluid Mechanics*; Jan. 2006 – Dec. 2008

Chair of Bingham Award Committee, *Society of Rheology*, 2006

Member of APS Fluid Dynamics Prize Committee; Spring 2007 - Spring 2009

Member of SES Awards Subcommittee, *Society for Engineering Science* (SES); 2006 – 2008

Member-at-Large, U.*S. National Committee for Theoretical and Applied Mechanics* (USNC/TAM); Nov. 2007-present; Vice-President from May 2015.

Symposium Organizer, *XIVth International Congress on Rheology*; Monterey CA, August 2008

Member of the International Advisory Committee, *Vth Pacific Rim Congress on Rheology*, Sapporo, Japan; Aug. 2010

Scientific Advisory Committee; *Biological & Pharmaceutical Complex Fluids: New Trends in Characterizing Microstructure, Interactions & Properties*; Tomar Portugal, 2012

Executive Editor, *J. Non-Newt. Fluid Mech*. Jan. 2001 – Dec. 2009.

Chair of the Metzner Award Committee, *Society of Rheology,* 2012

Symposium Organizer, *XVth International Congress on Rheology*; Lisbon, Portugal, August 2012

Editorial Boards, *Applied Rheology; Rheologica Acta, J. Rheology, J. Non-Newt. Fluid Mech*. Ongoing

Society of Rheology Executive Committee, Member at Large 2012 – 2013; Vice-President 2013-2015

President of the Society of Rheology, 2015 – 2017;

US National Committee on Theoretical & Applied Mechanics (USNC/TAM); Member at Large (2007-2011); Vice-Chair (2015-2016); Chair (2017-2018).

Synergistic/Outreach/Educational Activities

Co-Developed a yearlong integrated and interactive thermal-fluids engineering course (MIT Course #2.005/6) which is now a required core course for all ME sophomores/juniors. Awarded the school-wide *Bose Award for Teaching Excellence,* May 2000 (see also: Özer, T., Kenworthy, M., Brisson, J.G., Cravalho, E.G. and McKinley, G.H., "On Developments in Interactive Web-Based Learning Modules in a Thermal-Fluids Engineering Course", *Int. J. Engng. Ed*., **19**(2), (2003), 305-315: Promoted to School of Engineering Professorship in Teaching Innovation (July 2006)

Co-taught SOR Short Course on Extensional Rheology (with D.F. James, D.G. Baird), Monterey, 1997.

Co-taught an industrial short course for practicing rheologists: "Rheology Symposium" TA Instruments, New Castle DE, every May 1995-2000 inclusive.

Co-Taught Summer Professional Program in "Rheological Behavior of Polymeric Liquids" (PST102s) at MIT with Prof. R. C. Armstrong June 1995, July 1996, June 1998, July 2000.

Developed a one-hour introductory class on 'Nanotechnology and Nanomaterials' for 5th/6th grade students: presented in Marlborough and Acton MA school districts, May 2003.

Golden Gate Polymer Forum; 2-Day Short Course in Complex Fluids, Palo Alto, CA. June 2011.

AIP Industrial Rheology Forum, Cleveland, OH Oct. 2011.

Honorary Vice-President and Member of the Programme Working Group for the *London International Youth Science Forums* (LIYSF) from August 1994. In addition to program development, I present a biannual lecture on "Chaos and Nonlinear Dynamics" to 250 11th/12th grade students from 50 countries (see http://www.liysf.org.uk)

Collaborators (last 5 years)

Kyung Ahn (SNU), Manuel Alves (U. Porto), Rama Bansil (BU), Osman Basaran (Purdue), David V. Boger (University of Melbourne), Adam Burbidge (Nestlé S.A.), Robert E. Cohen (M.I.T.), R Cohn (U. Louisville), Pamela Cook (U. Delaware), Justin Cooper-White (U. Queensland), Christian Clasen (U. Leuven), Thibaut Divoux Lyon/Bordeaux), Pat Doyle (M.I.T.), Jens Eggers (Bristol Univ), Shyam Erramilli (BU), M.-A. Fardin (Univ Paris VII, Lyon); Doug Fudge (U. Guelph), William Hartt, (P&G), Paula Hammond (M.I.T), Ole Hassager (Danish Technical University), Neville Hogan (M.I.T.), Lynn Gladden (U. Cambridge), Lorna Gibson (M.I.T.), David F. James (U. Toronto), Mike Johns (U. Cambridge), Seung-Joon Lee (SNU), S. Lerouge (Univ Paris Diderot); S. Manneville (Univ Lyon); Chris Macosko (Minnesota), Jason Maxey (Halliburton), David Olagunju (U. Delaware), Peter Pershan (Harvard Univ), Fernando Pinho (U. Minho), Michael Renardy (Virginia Tech), Lucy Rodd (Univ.

Queensland), Tam Sridhar (Monash University), Howard Stone (Harvard Univ.), Peter Szabo (D.T.U.), Anubhav Tripathi (Brown University), Mehmet Toner (Harvard/MGH), Ken Walters (Univ. Wales), Minwu Yao (Goodyear), Manfred Wilhelm (Karlsruhe IT).

Graduate Thesis Advisors

Robert A. Brown (President, Boston Univ.), Robert C. Armstrong (Associate Director, MIT Energy Initiative & Chemical Engineering, M.I.T.).

Graduate students and post doctoral researchers (cumulative from 1992–2015 by year)

Postdoctoral Associates: Stephen H. Spiegelberg, Peyman Pakdel, Gavin J. C. Braithwaite, Anubhav Tripathi, Sahraoui Chaieb, Aaron Avagliano, Amy Shen, José Bico, Christian Clasen, Hojun Lee, YoungJun Lee, Volkmar von Arnim, Mónica Oliveira; Christopher J. Pipe; Phillip Erni, Pradipto Bhattarcharyya, Anish Tuteja, Fang Xu, Trushant Majmudar, Johannes Soulages, Vivek Sharma, Arezoo Ardekani, Adam Meuler, Simon Haward, Dora Medina, Dayong Chen, Andrew Milne, Alexander Barbati, Hossein Sojoudi, Safa Jamali, Salah Faroughi.

Graduate Students: Samuel Gaudet, Michael Kezirian, Xiao-Dong Pan, Leif Becker, Mark Arigo, Shelley L. Anna, Jonathan P. Rothstein, Maribel Vazquez. Daniel C. Mazzucco, Ryan Welsh, Nikola Kojic, Jacqueline Ashmore, Anna E. Park, Edward Kopesky, Lashanda James-Korley, Greg Pollock, Suraj Deshmukh, Giorgia Bettin, Tim P. Scott, Roger Yeh, Trevor Ng, Benjamin Wang, Giorgia Bettin, Shawna Liff, Abhinandan Agrawal, Lucy E. Rodd, Matthieu Varagnat, Jerome Crest, Randy H. Ewoldt, Nahn-Ju Kim, Wonjae Choi, Jeremy Gordon, Avid Boustani, Jerome Crest, Murat Ocalan, Jason Rich, Marc-Antoine Fardin, Thomas Ober, Chris Dimitriou, Shreerang Chhatre, Ken Park, Sarah Bates, Siddarth Sreenivasan, Ahmed Helal, Yves Matton, Aditya Jaishankar, Bavand Keshavarz, Divya Panchanathan, Michela Geri, Setareh Shahsavari, Caroline Wagner, Anoop Rajappan, Jianyi Du.

Consulting & Issued Patents:

US Patent # 5,588,509 Splined Vibration Device Using ER Fluids (w/ Bridgestone Corp.)

US Patent # 6,711,941 Braithwaite G, McKinley G.H., Spiegelberg S.H., Apparatus and Methods for Measuring Extensional Rheological Properties of a Material (w/ Cambridge Polymer Group).

U.S. Patent #6,852,772 Muratoglu, Orhun; Spiegelberg Stephen H.; McKinley, Gareth H.; A High Modulus Crosslinked Polyethylene with Reduced Residual Free Radical Concentration Prepared Below the Melt; (w/ Cambridge Polymer Group); continued by U.S. Patent #7,166,650.

U.S. Patent #7,896,019, S. Deshmukh, G. Bettin, G.H.McKinley, Active Controlled Energy Absorber Using Responsive Fluids".

U.S. Patent #7,304,097 B2 (continuation); Dec 4, 2007; continued by US #7,505,774; Muratoglu, Orhun; Spiegelberg Stephen H.; McKinley, Gareth H.; *High Modulus Crosslinked Polyethylene with Reduced Residual Free Radical Concentration Prepared Below the Melt*.

US Patent #9,120,669 Sept 1, 2015: C. Chang, H. Choi, K. Park, G.H. McKinley, R.E. Cohen, G. Barbastathis, *Process for Fabricating High Aspect Ratio Tapered nanocone Structures*, MIT.

US Patent #9,289,302; March 22, 2016 Thomas, B., Charlebois, S.J., Yakimicki, D., Mason, J., Spiegelberg, S.H., Braithwaite, G., McKinley, G., Muratoglu, O. *Mosaicplasty Constructs*, US Patent. Filed 7/20/99; (issued 3/22/16).

US Patent #9,469,083. Issued 10/18/16. H. Choi, J.-G. Kim,, K.-C. Park, R.E. Cohen, G. Barbastathis, G.H. McKinley; "*Inverted Nanocone Structures for Multifunctional Surfaces and their Fabrication Process*"; U.S. Patent Filed 13/932.066.

US Patent #9,352,258. Issued 2/11/2016. K.-C. Park, S. Chhatre, R.E. Cohen, G.H. McKinley, *Liquid-Collecting Permeable Structure* (MIT Disclosure #15712 filed January 18, 2013;). US Patent Application 61/751,039.

US Patent #9,650,518. Issued 5/16/2017. A.J. Meuler, J. M. Mabry, R.E. Cohen, G.H. McKinley *Liquid Repellent Surfaces*, Submitted 1/4/13; MIT case 14679; USPTO 13/734,446.

An additional 10 disclosures are in various stages of preparation with MIT TLO.

Consultant for Bridgestone/Firestone, W.R. Grace & Co., PPG Fiberglass, GE Research & Development, Proctor & Gamble, Nestlé S.A., ExtrudeHone Corp., Saltime Inc., ASM International, Minerals Technologies Inc.,

Instrumentation Laboratories, Cabot Corp., Schick/Wilkinson Sword, TA Instruments, Warner-Lambert (now Pfizer), Daktari LLC, 24-M LLC, Living Proof; Sun Technologies; Neograft, Ingredion.

Co-Founder and Minority Shareholder, Cambridge Polymer Group, July 1997-present.

Representative Publications (from approximately 275 total publications)

ORCID ID: **HTTP://ORCID.ORG/0000-0001-8323-2779**

Kwon, G., Panchanathan D., Mahmoudi Seyed R., Gondal, Mohammed A., **McKinley, G.H**., Varanasi, K.K., Visible-light-guided Manipulation of Liquid Motion on Photoresponsive Surfaces, *Nature Comm.* (2017), **8**, 14968.

Kim, S., Zhao, H., Sojoudi, H., **McKinley, G.H.,** Gleason, K.K., Hart, A.J., Micrometer Resolution Flexoprinting Using Nanoporous Stamps, *Science Advances*, (2016), **2**(12), e160660.

Jamali, S., **McKinley, G.H.,** Armstrong, R.C., Microstructural Rearrangements and Their Rheological Implications in a Model Thixotropic Elasto-Visco-Plastic Fluid, *Phys. Rev. Lett.*, (2017), **118**, 048003.

Gondal, M.A., Sadullah, M.S., Qahtan, T.F., Dastageer, M. A., Baig U., **McKinley, G.H.** Fabrication and Wettability Study of WO3 Coated Photocatalytic Membrane for Oil-Water Separation: A Comparative Study with ZnO Coated Membrane, *Sci. Rep.* (2017), **8**, 1686.

Keshavarz, B., Houze, E.C., Moore, J.R., Koerner, M.R., **McKinley, G.H**. Ligament-Mediated Fragmentation of Viscoelastic Liquids, *Phys. Rev. Lett.* (2016), **117** 154502. DOI: 10.1103/PhysRevLett.117.154502.

Park, K.-C., S. Srinivasan, Chhatre, S.S., Cohen, R.E. and **McKinley G.H.**, Fog Harvesting Mesh Surfaces. *Langmuir*, (2013), **29**(43), 13269-13277, DOI: dx.doi.org/10.1021/la402409f. (55 citations).

Park, K.-C., H. Choi, C.-H. Chang, R.E. Cohen, **G.H. McKinley**, and G. Barbastathis, Nanotextured Silica Surfaces with Robust Superhydrophobicity and Omnidirectional Broadband Supertransmissivity. *ACS Nano*, (2012) **6**(5), 3789-3799. (190 citations).

Meuler, A.S., Smith, J.D., Varanasi, K., Mabry, J., **McKinley, G.H.** and Cohen, R.E., Relationships between Water Wettability and Ice Adhesion, *ACS Applied Materials & Interfaces*, **2**(11), (2010), 3100-3110. (196 citations).

Choi, W., Tuteja, A., Mabry, J.M., Cohen, R.E. and **McKinley, G.H.,** A Modified Cassie-Baxter Model to Explain Contact Angle Hysteresis and Anisotropic Wettability on Non-Wetting Textured Surfaces, *J. Coll. Int. Sci.*, (2009), **339**(1); 208-216; DOI 10.1016/j.jcis.2009.07.027. (209 citations).

Choi, W., Tuteja, A., Chhatre, S., Cohen, R.E. and **McKinley, G.H.,** Fabrics with tuneable oleophobicity, *Adv. Mat.*, (2009),**21,** 2190-2196. (225 citations).

Pipe, C.J. and **McKinley, G.H.,** Microfluidic Rheometry, *Mech. Research Comm.*, (2009), **36** 110-120. (103 citations).

Ewoldt, R.H., **McKinley, G.H.** and Hosoi, A.E., New Measures for Characterizing Nonlinear Viscoelasticity in Large Amplitude Oscillatory Shear, *J. Rheol.*, **52**(6), (2008), 1427-1458. (277 citations).

Tuteja, A., Choi, W., Mabry, J.M., Cohen, R.E. and **McKinley, G.H.,** Robust Omniphobic Surfaces, *Proc. Nat. Acad. Sci.*, **105**(47), (2008), 18200-18205. (489 citations).

Tuteja, A., Choi, W., Ma, M., Mabry, J.M., Mazzella, S.A., Rutledge, G.C., Cohen, R.E. and **McKinley, G.H.,** Designing Superoleophobic Surfaces, *Science*, **318** (2007), 1618-1622. (1306 citations).

Rodd, L.E., Scott, T.P., Boger, D.V., Cooper-White, J.J. and **McKinley, G.H.,** The Inertio-Elastic Planar Entry Flow of Low-Viscosity Elastic Fluids in Micro-Fabricated Geometries, *J. Non-Newt. Fluid Mech.*, (2005), **129**, 1-22. (156 citations).

Rodd, L.E., Scott, T.P., Cooper-White, J.J. and **McKinley, G.H**., Capillary Breakup Rheometry of Low-Viscosity Elastic Fluids, *Appl. Rheol.*, (2005), **15**(1) 12-27. (158 citations).

Lau, K.S.K., Bico, J., Teo, K.B.K., Chhowalla, M., Amaratunga, G.A.J., Milne, W., **McKinley, G.H**., Gleason, K. K., Superhydrophobic Carbon Nanotube Forests†, *Nanoletters*, **3**(12), (2003), 1701-1705. (1107 citations).

Anna, S.L. and **McKinley, G.H.,** Elastocapillary Thinning and Breakup of Model Elastic Liquids, *J. Rheol.* **45**(1), (2001), 115-138. (214 citations).

Pakdel, P. and **McKinley, G.H.,** Elastic Instability and Curved Streamlines, *Phys. Rev. Lett.*, **77**(12), (1996), 2459-2462. (120 citations).

McKinley, G.H., Pakdel, P. and Öztekin, A., Geometric and Rheological Scaling of Purely Elastic Flow Instabilities, *J. Non-Newt. Fluid Mech.*, **67** (1996),19-48. (128 citations)

Book Chapters/Review Articles/Commentaries

Hyun, K., Wilhelm, M., Klein, C.O., Cho, K.S., Nam, J.G., Ahn, K.H., Lee, S.J., Ewoldt, R.H. and McKinley, G.H., A Review of Nonlinear Oscillatory Shear Tests: Analysis and Application of Large Amplitude Oscillatory Shear (LAOS), *Rev. Poly. Sci*, (2011), **36**, 1697 –1753.

Meuler, A.J., McKinley G.H. and Cohen, R.E. "Exploiting Topographical Texture to Impart Icephobicity", *ACS Nano* **4**(12) 7048-7052, Dec. 2010.

Pipe, C.J. and McKinley, G.H., Microfluidic Rheometry, *Mech. Research Comm.*, (2009), **36** 110-120

Tuteja, A., Choi, W., McKinley, G.H., Cohen, R.E. and Rubner, M.F., Design Parameters for Superhydrophobicity and Superoleophobicity, *MRS Bulletin*, **33**(8), (2008), 752-758.

McKinley, G. H. & Spiegelberg, S.H. "Elongational Flows", Handbook of Fluid Mechanics, Springer-Verlag, Spring. 2006.

McKinley, G. H. "Capillary Thinning and Breakup of Complex Liquids", Annual Rheology Reviews, British Society of Rheology, (Eds. D.M. Binding & K. Walters), Aug. 2005, pp 1-48.

McKinley, G. H. "Steady and Transient Motion of a Sphere in an Elastic Fluid", Transport Processes in Bubbles, Drops & Particles, Chapter 14 (Eds: R. Chhabra & D. DeKee) Taylor & Francis, 2002.

Sridhar, T. and McKinley, G.H., "Filament Stretching Rheometry of Complex Fluids", Annual Reviews of Fluid Mechanics, Annual Reviews Press, **34**, pp. 375-415, (2002).

McKinley, G.H., "Extensional flow and Instabilities of Elastic Polymer Solutions", Dynamics of Complex Fluids; Proceedings of the Royal Society/Unilever Indo-UK Forum., M. Adams (ed.), ICL Press, London, 1997.