John H. Lienhard V
Abdul Latif Jameel Professor, Department of Mechanical Engineering
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Education

B.S. in Engineering with concentration in Thermal Engineering, *Summa cum laude*
Dept. Chemical, Nuclear, and Thermal Engineering, University of California at Los Angeles, 1982

M.S. in Heat and Mass Transfer
Dept. Chemical, Nuclear, and Thermal Engineering, University of California at Los Angeles, 1984

Ph.D. in Fluid Dynamics
Dept. Applied Mechanics and Engineering Sciences, University of California at San Diego, 1988

Academic Appointments (selected)

July 2014 – present	Abdul Latif Jameel Professor of Water and Mechanical Engineering
July 2014 – Feb 2025	Founding Director, Abdul Latif Jameel Water and Food Systems Lab
July 2008 – April 2012	Associate Head, Mechanical Engineering Department
Feb 2009 – June 2014	Samuel C. Collins Professor of Mechanical Engineering
July 2008 – Nov. 2017	Founding Director, Center for Clean Water and Clean Energy
July 1997 – June 2025	Director, Rohsenow Kendall Heat Transfer Laboratory
Jan 1988 – present	MIT faculty member

Recent Papers

A. Deshmukh, M. Elimelech, J. H. Lienhard, "Partition-Diffusion-Reaction Bounds for Thin-Film Membrane Formation Kinetics," *Chemical Engineering Journal*, **524**:169670, 15 Nov. 2025, (doi)

J. H. Lienhard, "On the Nusselt number for thermally developed flow between isothermal parallel plates with dissipation," *ASME J. Heat Mass Transfer*, **147**(11):111801, November 2025, (open access)

Z. Mai, T. Yoshioka, A. Deshmukh, T. Yuan, J. Zhu, J. Yuan, R. R. Gonzales, A. Yamamoto, Y. Shi, W. Fu, K. Guan, Z. Li, P. Zhang, J. H. Lienhard, H. Matsuyama, "Dynamic sub-nanoscale 'water fingers' during interfacial polymerization," *Small,* 2504497, 20 June 2025, (open access)

J. H. Lienhard, "Induced gradients in steady, two-dimensional heat conduction? Yes, but…," *ASME J. Heat Mass Transfer,* **147**(11):111401, November 2025, (open access)

S. Liu, Z. H. Foo, J. H. Lienhard, S. Keten, and R. M. Lueptow, "Membrane Charge Effects on Solute Transport in Nanofiltration: Experiments and Molecular Dynamics Simulations," *Membranes*, **15**(6):184, 18 June 2025. (open access)

E. W. Tow, Q. J. Wei, A. R. Abraham, K. L. Chua, M. J. Plumley, J. H. Lienhard, "Piloting Batch Reverse Osmosis with a Flexible Bladder for Water Recovery from Scaling-Prone Brine," *npj Clean Water*, **8**, eid:30, 15 April 2025. (open access).

T. Lee, Z. H. Foo, V. Nguyen, and J. H. Lienhard, "Enhancing Resource Circularity in Aluminum Production Through Nanofiltration of Waste Cryolite," *ACS Sust. Chem. Eng.*, **13**(2):846-858, 6 January 2025. (doi)

Z. H. Foo and J. H. Lienhard, "Emerging Membrane Technologies for Sustainable Lithium Extraction from Brines and Leachates: Innovations, Challenges, and Industrial Scalability," *Desalination*, online 11 December 2024, **598**:118411, 2025. (doi)

K.I. McKee and J.H. Lienhard V, "Symmetry criteria for the equality of interior and exterior shape factors with exact solutions," *ASME J. Heat Mass Transfer*, **146**(11):111401, November 2024. (open access).

Z. H. Foo, T. Lee, J. M. Wegmueller, S. M. Heath, J. H. Lienhard, "Toward a Circular Lithium Economy with Electrodialysis: Upcycling Spent Battery Leachates with Selective and Bipolar Ion-Exchange Membranes," *Environmental Science & Technology*, **58**(43):19486–19500, 17 October 2024. (doi)

Z. H. Foo, S. Liu, L. A. Kanias, T. Lee, S. M. Heath, Y. Tomi, T. Miyabe, S. Keten, R. M. Lueptow, J. H. Lienhard, "Positively-Coated Nanofiltration Membranes for Lithium Recovery from Battery Leachates and Salt-Lakes: Ion Transport Fundamentals and Module Performance," *Advanced Functional Materials*, **34**:2408685, 16 August 2024, eid:408685. (open access)

Eleven Other Significant Papers (of >300 peer-reviewed papers; N>35000, G>180, H>85, GoogleScholar).

K.G. Nayar, M.H. Sharqawy, L.D. Banchik, and J.H. Lienhard V, "Thermophysical properties of seawater: A review & new correlations that include pressure dependence," *Desalination*, **390**:1-24, July 2016. (doi)

D.M. Warsinger, E.W. Tow, K.G. Nayar, L.A. Maswadeh, and J.H. Lienhard V, "Energy Efficiency of Batch and Semi-batch (CCRO) Reverse Osmosis Desalination," *Water Research*, **106**:272-282, 2016. (doi)

D.M. Warsinger, J. Swaminathan, E. Guillen, H.A. Arafat, and J.H. Lienhard V, "Scaling and Fouling In Membrane Distillation for Desalination Applications," *Desalination*, **356**:294-313, 15 Jan. 2015. (doi)

R.K. McGovern and J.H. Lienhard V, "On the potential of forward osmosis to energetically outperform reverse osmosis desalination," *J. Membrane Sci.*, **469**:245-250, Nov. 2014. (doi)

D. Cohen-Tanugi, R.K. McGovern, S. Dave, J.H. Lienhard V, and J.C. Grossman, "Quantifying the Potential of Ultra-permeable Membranes for Water Desalination," *Energy Environ. Sci.*, **7**(3):1134-1141, Feb. 2014. (open access)

A.K. Plappally and J.H. Lienhard V, "Energy Requirements for Water Production, Treatment, End Use, Reclamation, and Discharge," *Renewable & Sustain. Energy Rev.*, **16**(7):4818-4848, Sept. 2012. (doi)

E.K. Summers, H.A. Arafat, and J.H. Lienhard V, "Energy efficiency comparison of single stage membrane distillation (MD) desalination cycles in different configurations," *Desalination*, **290**:54-66, 2012. (doi)

K.H. Mistry, R.K. McGovern, G.P. Thiel, E.K. Summers, S.M. Zubair, and J.H. Lienhard V, "Entropy generation analysis of desalination technologies," *Entropy*, **13**(10):1829-1864, Sept. 2011 (pdf).

G.P. Narayan, M.H. Sharqawy, E.K. Summers, J.H. Lienhard V, S.M. Zubair, and M.A. Antar, "The potential of solar-driven humidification-dehumidification desalination for small-scale decentralized water production," *Renewable & Sustainable Energy Reviews*, **14**(4):1187-1201, May 2010. (doi)

M.H. Sharqawy, J.H. Lienhard V, and S.M. Zubair, "The thermophysical properties of seawater: A review of existing correlations and data," *Desal. & Water Treatment*, **16**:354-380, April 2010. (pdf) (codes)

X. Liu, J.H. Lienhard V, and J.S. Lombara, "Convective Heat Transfer by Impingement of Circular Liquid Jets," *J. Heat Transfer*, **113**(3):571-582, 1991. (pdf)

Synergistic Activities

1. Industrial involvement: Co-founded Gradiant Corporation to commercialize HDH desalination inventions for treatment of industrial wastewaters. 42 issued US Patents and many more international patents, most licensed by the desalination and water treatment industry.
2. Research: Directed several large, multi-PI research programs in water, energy, and food, valued at more than $100M. Direct supervisor of > 90 graduate theses. Author of > 400 peer-reviewed papers. Research group received 15 best paper/poster/presentation awards from journals and natl./intl. conferences during 2011-2019. Has had funded international research collaborations in Chile, China, India, Kuwait, Saudi Arabia, Singapore, Spain, United Arab Emirates, and elsewhere.
3. Selected Honors & Awards. 2026, US National Academy of Engineering; 2025, Honorary Member of ASME; 2024 Lifetime Achievement Award, Intl. Desalination & Reuse Assoc.; 2021 AIChE D.Q. Kern Award; 2019, ASME E.F. Obert Award (best thermo paper); 2018, Chief Guest, IIT Ropar Convocation; 2015, ASME Heat Transfer Memorial Award; 2012, ASME Technical Communities Globalization Medal; 2003, Den Hartog Distinguished Educator, MIT; 1994, Graduate Student Council Teaching Award, MIT; 1992, Ralph R. Teetor Award, SAE; 1991, Best Paper Award, 26th ASME/AIChE Heat Transfer Conf.; 1988, Presidential Young Investigator Award, NSF.
4. Textbooks/Teaching: Author of textbooks on heat transfer, on thermal modeling, and on measurement & instrumentation. Heat transfer book has been online at no charge since 2002, and hundreds of thousands of copies have been downloaded worldwide. Measurements book has sold more than 100,000 copies. Created new courses on desalination, thermal modeling, and compressible flow. Managed ABET accreditation for MIT MechE department's 3 degrees (2007).
5. Professional Memberships. International Desalination Association; Fellow, American Society of Mechanical Engineers; Fellow, American Association for the Advancement of Science; Fellow, American Society of Thermal & Fluid Engineers; Scientific Council, Intl. Centre for Heat & Mass Transfer; Tau Beta Pi; Sigma Xi; TeX Users Group; Registered Professional Engineer (Mechanical), Massachusetts and Vermont.

Biographical sketch

John H. Lienhard V is the Abdul Latif Jameel Professor of Water and Mechanical Engineering at MIT. Lienhard's research and teaching have been in thermal science and engineering, including heat and mass transfer, water purification and desalination, and thermodynamics. He has also filled a number of administrative roles at MIT. He is a member of the US National Academy of Engineering.

Lienhard received his bachelor's and master's degrees in thermal engineering at UCLA from the Chemical, Nuclear, and Thermal Engineering Department, where he worked on buoyant instabilities in solar collectors and evaporating meniscus measurements for MED desalination systems. He joined MIT the month he completed his PhD in the Applied Mechanics and Engineering Science Department at UC San Diego, where he made wind-tunnel measurements of spectra and statistics in thermally stratified turbulent flows.

Lienhard's research on water purification has included thermal desalination (humidification-dehumidification, membrane distillation, and solar desalination), pressure-driven osmotic membrane separations (reverse osmosis, forward osmosis, and nanofiltration), electrodialysis, solvent extraction, bubble columns, scale formation and membrane fouling, salinity gradient power, management of high salinity brines, and energy efficiency analysis of desalination cycles. Lienhard has also done research on high-heat-flux engineering, liquid-jet-impingement cooling, and electronics thermal management. Lienhard has directly supervised more than 100 graduate theses, and he is the author of more than 300 peer-reviewed publications. He holds more than 40 US patents. Start-ups from his group include Gradiant Corporation (which he cofounded), Sandymount Technologies, and Harmony Desalting. Lienhard is a registered professional engineer in Massachusetts and Vermont.

Lienhard is an Honorary Member and Fellow of the American Society of Mechanical Engineers (ASME), a Fellow of the American Association for the Advancement of Science (AAAS), and a Fellow of the American Society of Thermal and Fluid Engineers (ASTFE). He is a recipient of the 1988 National Science Foundation Presidential Young Investigator Award, the 1992 SAE Teetor Award, the 2012 ASME Technical Communities Globalization Medal, and the 2015 ASME Heat Transfer Memorial Award, the 2019 ASME Edward F. Obert Award, the 2021 AIChE/ASME Donald Q. Kern Award, and the 2024 Lifetime Achievement Award of the International Desalination & Reuse Association. His 2020 study of flat-plate boundary layers was 2021's most accessed paper in the *Journal of Heat Transfer*.

Lienhard is the co-author of textbooks on heat transfer, on measurement and instrumentation, and on thermal modeling. His heat transfer book has been available online at no charge since 2002 (ahtt.mit.edu). This book was among the earliest engineering textbooks distributed in PDF format, and by 2012 more than 250,000 downloads had been logged. His measurements book has sold more than 100,000 copies. He has created new courses on desalination, on thermal modeling, and on compressible fluid mechanics. He has received several teaching awards at MIT, including the Den Hartog Distinguished Educator Award and the Graduate Student Council Teaching Award. He led the 2007 ABET accreditation of the Mechanical Engineering department. His YouTube video on entropy has been viewed more than 400,000 times.

Professor Lienhard directed the Rohsenow Kendall Heat Transfer Laboratory from 1997 to 2025 (RKLab), and the Center for Clean Water & Clean Energy at MIT and KFUPM from 2008 to 2017. Lienhard was the founding director of the Abdul Latif Jameel Water and Food Systems Lab at MIT (J-WAFS) from 2014 until 2025. During that time, J-WAFS awarded more than $25 million to water- and food-related research projects at MIT, supporting research in more than 40 departments, labs, and centers.