Stanford



Dr. Arun Majumdar

Chester Naramore Dean, Stanford Doerr School of Sustainability, Jay Precourt Professor, Prof of Mechanical Eng, of Energy Science & Eng, of Photon Science, Sr Fellow at Woods and, by courtesy, at Hoover & Prof, by court, of MS&E

Mechanical Engineering

CONTACT INFORMATION

- **Administrative Contact**

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Bio

BIO

Dr. Arun Majumdar is the inaugural Dean of the Stanford Doerr School of Sustainability. He is the Jay Precourt Provostial Chair Professor at Stanford University, a faculty member of the Departments of Mechanical Engineering and Energy Science and Engineering, a Senior Fellow and former Director of the Precourt Institute for Energy and Senior Fellow of the Woods Institute for the Environment and Senior Fellow by (courtesy) of the Hoover Institution. He is also a faculty in Department of Photon Science at SLAC.

In October 2009, Dr. Majumdar was nominated by President Obama and confirmed by the Senate to become the Founding Director of the Advanced Research Projects Agency - Energy (ARPA-E), where he served until June 2012 and helped ARPA-E become a model of excellence and innovation for the government with bipartisan support from Congress and other stakeholders. Between March 2011 and June 2012, he also served as the Acting Under Secretary of Energy, enabling the portfolio of Office of Energy Efficiency and Renewable Energy, Office of Electricity Delivery and Reliability, Office of Nuclear Energy and the Office of Fossil Energy, as well as multiple cross-cutting efforts such as Sunshot, Grid Modernization Team and others that he had initiated. Furthermore, he was a Senior Advisor to the Secretary of Energy, Dr. Steven Chu, on a variety of matters related to management, personnel, budget, and policy. In 2010, he served on Secretary Chu's Science Team to help stop the leak of the Deep Water Horizon (BP) oil spill.

Dr. Majumdar served as the Chair of the Advisory Board of the US Secretary of Energy, Jennifer Granholm. He led the Agency Review Team for the Department of Energy, Federal Energy Regulatory Commission and the Nuclear Regulatory Commission during the Biden-Harris Presidential transition. He served as the Vice Chairman of the Advisory Board of US Secretary of Energy, Dr. Ernest Moniz, and was also a Science Envoy for the US Department of State with focus on energy and technology innovation in the Baltics and Poland. He also serves on numerous advisory boards and boards of businesses, investment groups. government agencies and non-profit organizations.

After leaving Washington, DC and before joining Stanford, Dr. Majumdar was the Vice President for Energy at Google, where he assembled a team to create technologies and businesses at the intersection of data, computing and electricity grid.

Dr. Majumdar is a member of the US National Academy of Sciences, US National Academy of Engineering and the American Academy of Arts and Sciences. His research in the past has involved the science and engineering of nanoscale materials and devices, especially in the areas of energy conversion, transport and storage as well as biomolecular analysis. His current research focuses on redox reactions and systems that are fundamental to a sustainable energy future, multidimensional nanoscale imaging and microscopy, and an effort to leverage modern AI techniques to develop and deliver energy and climate solutions.

Prior to joining the Department of Energy, Dr. Majumdar was the Almy & Agnes Maynard Chair Professor of Mechanical Engineering and Materials Science & Engineering at University of California–Berkeley and the Associate Laboratory Director for energy and environment at Lawrence Berkeley National Laboratory. He also spent the early part of his academic career at Arizona State University and University of California, Santa Barbara.

Dr. Majumdar received his bachelor's degree in Mechanical Engineering at the Indian Institute of Technology, Bombay in 1985 and his Ph.D. from the University of California, Berkeley in 1989 under the supervision of Professor Chang-Lin Tien.

ACADEMIC APPOINTMENTS

- Professor, Mechanical Engineering
- Professor, Energy Science & Engineering
- Professor, Photon Science Directorate
- Senior Fellow, Precourt Institute for Energy
- Senior Fellow, Stanford Woods Institute for the Environment
- Professor (By courtesy), Materials Science and Engineering
- Hoover Senior Fellow (By courtesy), Hoover Institution
- Co-Director, Precourt Institute for Energy

ADMINISTRATIVE APPOINTMENTS

- Director, Berkeley Nanoscience and Nanoengineering Institute, UC Berkeley, (2005-2008)
- Director, Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, (2007-2009)
- Associate Laboratory Director for Energy and Environment, Lawrence Berkeley National Laboratory, (2009-2009)
- Acting Under Secretary of Energy, United States Department of Energy, (2011-2012)
- Founding Director, Advanced Research Projects Agency- Energy (ARPA-E)- United States Department of Energy, (2009-2012)

HONORS AND AWARDS

- Member, United States National Academy of Sciences (2020)
- Member, American Academy of Arts and Sciences (2013)
- Member, United States National Academy of Engineering (2005)
- Energy Systems Award, American Institute of Aeronautics and Astronautics (2019)
- Fellow, Indian National Academy of Engineering (2014)
- Aurel Stodola Medal and Lecture, ETH Zurich (2010)
- Heat Transfer Memorial Award, American Society of Mechanical Engineers (2006)
- Miller Professorship, University of California, Berkeley (2003-2004)
- Distinguished Alumnus Award, Indian Institute of Technology, Bombay (2003)
- Fellow, American Association for the Advancement of Science (2002)

- Fellow, American American Society of Mechanical Engineers (2002)
- Gustus Larson Memorial Award, American Society of Mechanical Engineers (2001)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Chair, Strategic Panel, Helmoltz Energy, Helmholtz Foundation (2025 - present)
- Member, Advisory Board, King Fahd University of Petroleum and Minerals (2025 - present)
- Member, Research, Innovation and Enterprise Council of Singapore (2025 - present)
- Chair, US Secretary of Energy Advisory Board (SEAB) (2021 - 2024)
- Member, International Advisory Panel- Energy, Singapore Ministry of Trade and Industries (2014 - present)
- Member, Science Advisory Board, Oak Ridge National Laboratory (2014 - 2020)
- Member, Advisory Council, Electric Power Research Institute (2014 - 2018)
- Council Member, United States National Academy of Engineering (2014 - 2017)
- Member & Vice Chairman, Secretary of Energy's Advisory Board, Department of Energy (2014 - 2017)
- Member, Science Policy Board, Stanford Linear Accelerator Center (SLAC) (2014 - 2016)
- Member, United States Delegation, US-India Track II Dialogue on Climate Change and Energy (2014 - 2016)
- Science Envoy, US Department of State (2014 - 2015)
- Member, Selection Committee, Infosys Science Foundation (2012 - 2017)
- Member, Section 10 Peer Committee, United States National Academy of Engineering (2011 - 2014)
- Member, United States National Academy of Engineering Awards Committee (2009 - 2012)
- Member, Advisory Board, Nanoscience and Technology Institute, University of Central Florida (2008 - 2009)
- Chair and Member, Advisory Committee, NSF Engineering Directorate (2006 - 2009)
- Member, Advisory Board, Engineering Science, Sandia National Laboratories (2006 - 2008)
- Member, Nanotechnology Technical Advisory Group, President's Council of Advisers on Science and Technology (PCAST) (2003 - 2007)
- Member, External Advisory Board, NSF Center for Nanoscale Computing Network, Purdue University (2003 - 2006)
- Member, Council on Materials Science and Engineering, Basic Energy Science, Office of Science, Department of Energy (2002 - 2007)
- Founding Chair, Advisory Board, ASME Nanotechnology Institute (2001 - 2006)
- Member, Council on Energy and Engineering Research (CEER), Basic Energy Sciences, US Department of Energy (1998 - 2002)

PROFESSIONAL EDUCATION

- PhD, University of California, Berkeley , Mechanical Engineering (1989)
- MS, University of California, Berkeley , Mechanical Engineering (1987)
- BTech, Indian Institute of Technology , Mechanical Engineering (1985)

LINKS

- Magic Lab: http://web.stanford.edu/group/magiclab/home.html
- ME-16N: http://ME16N.stanford.edu

Teaching

COURSES

2026-27

- Sustainable Energy for Future Presidents: SUSTAIN 101A (Win)

2025-26

- Sustainable Energy for Future Presidents: SUSTAIN 101A (Win)

2024-25

- Sustainable Energy for Future Presidents: SUSTAIN 101A (Win)

2023-24

- Sustainable Energy for Future Presidents: SUSTAIN 101A (Win)

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Lohyun Kim, Kanishka Panda, Yu Wang

Doctoral Dissertation Advisor (AC)

Rob Buechler, Joshua Martinez-Navarro, Xintong Xu

Doctoral Dissertation Co-Advisor (AC)

Dolly Mantle, Henry Moise, Shradha Sapru

Master's Program Advisor

Justin Shih

Publications

PUBLICATIONS

- **Autothermal methane pyrolysis: Scalable heat integration for hydrogen and graphite production.** *Science (New York, N.Y.)*
  Moise, H., Moll, S., Pathak, S., Martinez-Navarro, J., Varanasi, S., Xu, K., McFarland, E., Majumdar, A., Cargnello, M.
  2026; 393 (6815): 1014-1020
- **The Efficiencies and Products of Dilute Methane Oxidation in a Chlorine Radical Photoreactor.** *Environmental science & technology*
  Randall, R., Kessler, M. I., Jackson, R. B., Majumdar, A.
  2026
- **Cooperativity Between Free Radicals Promotes Selective Methane Oxidation.** *Joule*
  Wan, G., Heyer, A. J., Sun, E., Xie, C., Solomon, E. I., Majumdar, A.
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- **A Humidity-Tolerant Photocatalyst for Methane Removal.** *Environmental science & technology*
  Kessler, M. I., Randall, R., Wan, G., Xu, K., Zhang, Y., Dionne, J. A., Jackson, R. B., Majumdar, A.
  2026
- **Atmospheric-pressure ammonia synthesis on AuRu catalysts enabled by plasmon-controlled hydrogenation and nitrogen-species desorption** *NATURE ENERGY*
  Yuan, L., Bourgeois, B. B., Begin, E., Zhang, Y., Dai, A. X., Cheng, Z., Mckeown-Green, A. S., Xue, Z., Cui, Y., Xu, K., Wang, Y., Jones, M. R., Majumdar, et al
  2025
- **Solar and batteries are affordable options for US households** *NATURE ENERGY*
  Sun, T., Feng, Y., Zanocco, C., Flora, J., Majumdar, A., Rajagopal, R.
  2025
- **Solar and battery can reduce energy costs and provide affordable outage backup for US households** *NATURE ENERGY*
  Sun, T., Feng, Y., Zanocco, C., Flora, J., Majumdar, A., Rajagopal, R.
  2025

- **PyOpticon: An Open-Source Python Package for Laboratory Control, Automation, and Visualization** *CHEMISTRY OF MATERIALS*
  Randall, R., Majumdar, A.
  2025
- **Simultaneous Characterization of In-Plane and Cross-Plane Resistivities in Highly Anisotropic 2D Layered Heterostructures.** *ACS nano*
  Weng, S., Wang, Y., Price, C., Blackwood, H. R., Choffel, M., Miller, A., Li, R., Chen, M., Lu, P., Ilkhani, S., Majumdar, A., Johnson, D. C., Cronin, et al
  2024
- **Requirements for CO₂-free hydrogen production at scale** *JOULE*
  Sun, E., Sarkar, A., Gigantino, M., Randall, R., Jaffer, S., Rojas, J., Zhai, S., Majumdar, A.
  2024; 8 (6)
- **Cost modeling of photocatalytic decomposition of atmospheric methane and nitrous oxide** *ENVIRONMENTAL RESEARCH LETTERS*
  Randall, R., Jackson, R. B., Majumdar, A.
  2024; 19 (6)
- **Spin disorder control of topological spin texture.** *Nature communications*
  Zhang, H., Shao, Y. T., Chen, X., Zhang, B., Wang, T., Meng, F., Xu, K., Meisenheimer, P., Chen, X., Huang, X., Behera, P., Husain, S., Zhu, et al
  2024; 15 (1): 3828
- **Exploring the potential of non-residential solar to tackle energy injustice** *NATURE ENERGY*
  Wussow, M., Zanocco, C., Wang, Z., Prabha, R., Flora, J., Neumann, D., Majumdar, A., Rajagopal, R.
  2024
- **Geospatial mapping of distribution grid with machine learning and publicly-accessible multi-modal data.** *Nature communications*
  Wang, Z., Majumdar, A., Rajagopal, R.
  2023; 14 (1): 5006
- **Local and utility-wide cost allocations for a more equitable wildfire-resilient distribution grid** *NATURE ENERGY*
  Wang, Z., Wara, M., Majumdar, A., Rajagopal, R.
  2023
- **Imaging the electron charge density in monolayer MoS2 at the Ångstrom scale.** *Nature communications*
  Martis, J., Susarla, S., Rayabharam, A., Su, C., Paule, T., Pelz, P., Huff, C., Xu, X., Li, H. K., Jaikissoon, M., Chen, V., Pop, E., Saraswat, et al
  2023; 14 (1): 4363
- **Fluids and Electrolytes under Confinement in Single-Digit Nanopores.** *Chemical reviews*
  Aluru, N. R., Aydin, F., Bazant, M. Z., Blankschtein, D., Brozena, A. H., de Souza, J. P., Elimelech, M., Faucher, S., Fourkas, J. T., Koman, V. B., Kuehne, M., Kulik, H. J., Li, et al
  2023
- **Transport Mediating Core-Shell Photocatalyst Architecture for Selective Alkane Oxidation.** *Nano letters*
  Xie, C., Sun, E., Wan, G., Zheng, J., Gupta, R., Majumdar, A.
  2023
- **Iron-Poor Ferrites for Low-Temperature CO2 Conversion via Reverse Water-Gas Shift Thermochemical Looping** *ACS SUSTAINABLE CHEMISTRY & ENGINEERING*
  Rojas, J., Sun, E., Wan, G., Oh, J., Randall, R., Haribal, V., Jung, I., Gupta, R., Majumdar, A.
  2022
- **Thermodynamic guiding principles of high-capacity phase transformation materials for splitting H2O and CO2 by thermochemical looping** *JOURNAL OF MATERIALS CHEMISTRY A*
  Zhai, S., Nam, J., Sai Gautam, G., Lim, K., Rojas, J., Toney, M. F., Carter, E. A., Jung, I., Chueh, W. C., Majumdar, A.
  2022
- **The use of poly-cation oxides to lower the temperature of two-step thermochemical water splitting** *ENERGY & ENVIRONMENTAL SCIENCE*
  Zhai, S., Rojas, J., Ahlborg, N., Lim, K., Toney, M. F., Jin, H., Chueh, W. C., Majumdar, A.
  2018; 11 (8): 2172–78

- **A dual-mode textile for human body radiative heating and cooling** *SCIENCE ADVANCES*
  Hsu, P., Liu, C., Song, A. Y., Zhang, Z., Peng, Y., Xie, J., Liu, K., Wu, C., Catrysse, P. B., Cai, L., Zhai, S., Majumdar, A., Fan, et al
  2017; 3 (11): e1700895

- **Heterodyne x-ray diffuse scattering from coherent phonons** *STRUCTURAL DYNAMICS*
  Kozina, M., Trigo, M., Chollet, M., Clark, J. N., Glownia, J. M., Gossard, A. C., Henighan, T., Jiang, M. P., Lu, H., Majumdar, A., Zhu, D., Reis, D. A.
  2017; 4 (5): 054305

- **Evaluation of a Silicon Sr-90 Betavoltaic Power Source** *SCIENTIFIC REPORTS*
  Dixon, J., Rajan, A., Bohlemann, S., Coso, D., Upadhyaya, A. D., Rohatgi, A., Chu, S., Majumdar, A., Yee, S.
  2016; 6

- **Sr Betavoltaic Power Source.** *Scientific reports*
  Dixon, J., Rajan, A., Bohlemann, S., Coso, D., Upadhyaya, A. D., Rohatgi, A., Chu, S., Majumdar, A., Yee, S.
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- **Elucidating the synergistic mechanism of nickel-molybdenum electrocatalysts for the hydrogen evolution reaction** *MRS COMMUNICATIONS*
  Mckay, I. S., Schwalbe, J. A., Goodman, E. D., Willis, J. J., Majumdar, A., Cargnello, M.
  2016; 6 (3): 241-246

- **Label-Free Electrical Detection of Enzymatic Reactions in Nanochannels.** *ACS nano*
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  2016; 10 (8): 7476-7484

- **Nanoscale thermal transport. II. 2003-2012** *APPLIED PHYSICS REVIEWS*
  Cahill, D. G., Braun, P. V., Chen, G., Clarke, D. R., Fan, S., Goodson, K. E., Keblinski, P., King, W. P., Mahan, G. D., Majumdar, A., Maris, H. J., Phillpot, S. R., Pop, et al
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- **Crossover from incoherent to coherent phonon scattering in epitaxial oxide superlattices** *NATURE MATERIALS*
  Ravichandran, J., Yadav, A. K., Cheaito, R., Rossen, P. B., Soukiassian, A., Suresha, S. J., Duda, J. C., Foley, B. M., Lee, C., Zhu, Y., Lichtenberger, A. W., Moore, J. E., Muller, et al
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- **Opportunities and challenges for a sustainable energy future** *NATURE*
  Chu, S., Majumdar, A.
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- **Nanostructured Thermoelectrics: Big Efficiency Gains from Small Features** *ADVANCED MATERIALS*
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- **Nanowires for Enhanced Boiling Heat Transfer** *NANO LETTERS*
  Chen, R., Lu, M., Srinivasan, V., Wang, Z., Cho, H. H., Majumdar, A.
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- **Enhanced thermoelectric performance of rough silicon nanowires** *NATURE*
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- **Thermoelectricity in molecular junctions** *SCIENCE*
  Reddy, P., Jang, S., Segalman, R. A., Majumdar, A.
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- **Rectification of ionic current in a nanofluidic diode** *NANO LETTERS*
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- **Solid-state thermal rectifier** *SCIENCE*

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- **Thermal conductivity reduction and thermoelectric figure of merit increase by embedding nanoparticles in crystalline semiconductors** *PHYSICAL REVIEW LETTERS*
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- **Thermal conductance and thermopower of an individual single-wall carbon nanotube** *NANO LETTERS*
  Yu, C. H., Shi, L., Yao, Z., Li, D. Y., Majumdar, A.
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- **DNA translocation in inorganic nanotubes** *NANO LETTERS*
  Fan, R., Karnik, R., Yue, M., Li, D. Y., Majumdar, A., Yang, P. D.
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- **Electrostatic control of ions and molecules in nanofluidic transistors** *NANO LETTERS*
  Karnik, R., Fan, R., Yue, M., Li, D. Y., Yang, P. D., Majumdar, A.
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- **A 2-D microcantilever array for multiplexed biomolecular analysis** *JOURNAL OF MICROELECTROMECHANICAL SYSTEMS*
  Yue, M., Lin, H., Dedrick, D. E., Satyanarayana, S., Majumdar, A., Bedekar, A. S., Jenkins, J. W., Sundaram, S.
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- **Thermoelectricity in semiconductor nanostructures** *SCIENCE*
  Majumdar, A.
  2004; 303 (5659): 777-778
- **Thermal conductivity of individual silicon nanowires** *APPLIED PHYSICS LETTERS*
  Li, D. Y., Wu, Y. Y., Kim, P., Shi, L., Yang, P. D., Majumdar, A.
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- **Nanoscale thermal transport** *JOURNAL OF APPLIED PHYSICS*
  Cahill, D. G., FORD, W. K., Goodson, K. E., Mahan, G. D., Majumdar, A., Maris, H. J., Merlin, R., Phillpot, S. R.
  2003; 93 (2): 793-818
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- **Thermal transport measurements of individual multiwalled nanotubes** *PHYSICAL REVIEW LETTERS*
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- **Bioassay of prostate-specific antigen (PSA) using microcantilevers** *NATURE BIOTECHNOLOGY*
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- **Scanning thermal microscopy** *ANNUAL REVIEW OF MATERIALS SCIENCE*
  Majumdar, A.
  1999; 29: 505-585
- **MICROSCALE HEAT-CONDUCTION IN DIELECTRIC THIN-FILMS** *JOURNAL OF HEAT TRANSFER-TRANSACTIONS OF THE ASME*
  Majumdar, A.
  1993; 115 (1): 7-16
- **FRACTAL MODEL OF ELASTIC-PLASTIC CONTACT BETWEEN ROUGH SURFACES** *JOURNAL OF TRIBOLOGY-TRANSACTIONS OF THE ASME*
  Majumdar, A., BHUSHAN, B.
  1991; 113 (1): 1-11