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AHMED F. GHONIEM

Robert C. Crane Professor of Mechanical Engineering
Principal Investigator, Center of Excellence for Energy
Director, Center for Energy and Propulsion Research
Director, Reacting Gas Dynamics Laboratory
Massachusetts Institute of Technology

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PROFESSIONAL AND ACADEMIC INTERESTS

1. Energy Conversion science and engineering, including combustion, thermochemical and electro-thermochemical processes, their integration, and interface with renewable energy systems such as solar thermal and biofuels.
2. High-performance computing, science discovery through advanced computing, information technology, computational mathematics, and application to turbulence and combustion. CFD in combustion, dense multiphase flow, supercritical flow phenomena and electrochemistry.
3. Combustion fundamentals and modeling, combustion dynamics and thermo-acoustic instability, noise, signature, emissions and performance. Active control of combustion.
4. Carbon-capture research, including gasification and reforming, oxy-combustion, ITM reactor development, Chemical looping combustion. CO₂ reduction and reuse.
5. Renewable energy sources and conversion including biomass to liquid via thermochemical pathways, hybrid CSP and solar reforming.
6. Environmental footprint of energy production including CO₂ and water consumption.
7. Electro-thermochemical modeling and simulations of solid oxide fuel cells, direct carbon fuel cells and systems, ITM reactors and oxygen carrier for chemical looping.

WORK

Department of Mechanical Engineering, *Massachusetts Institute of Technology*.

Professor, 1992, associate professor, 1986, assistant professor, 1983.

Lawrence Berkeley Laboratory, *University of California, Berkeley*.

Research Scientist, November 80-July 83.

Department of Mechanical Engineering, *University of California, Berkeley*.

Research/Teaching Assistant, January 77-March 80.

Mechanical Engineering Department, *Calgary University, Alberta, Canada*.

Research/Teaching Assistant, September 75-September 76.

Mechanical Engineering Department, *Cairo University, Egypt*.

Research/Teaching Assistant, October 73-September 75.

EDUCATION

Ph.D. Mechanical Engineering, University of California, Berkeley, June 1980.

M.Sc. Mechanical Engineering, Cairo University, Egypt, October 1975.

B.Sc. Mechanical Engineering, Cairo University, Egypt, July 1973.

PROFESSIONAL SOCIETIES (current)

American Society of Mechanical Engineers, Fellow
American Physical Society, Fellow
The Combustion Institute, Fellow
American Institute of Aeronautics and Astronautics, Associate Fellow
Society of Automotive Engineers, member

HONORS

Fellow of the Combustion Institute, 2018
“Committed to Caring Professor” at MIT, 2016
Fellow of the American Physical Society (APS), 2016
AIAA Propellants and Combustion Award, 2016
ASME James Harry Potter Gold Medal, 2015
KAUST Investigator Award, 2008-2015.
Robert C. Crane Professor, MIT, since 2006
Fellow of American Society of Mechanical Engineers (ASME)
Associate Fellow of American Institute of Aeronautics and Astronautics (AIAA)
Society of Automotive Engineering, Ralph R. Teetor Educational Award
Edgerton Professorship, Massachusetts Institute of Technology
Certificate of Recognition, NASA
Research Initiation Award, National Science Foundation
Pi Tau Sigma Award, Excellent Teaching, U. of California, Berkeley
Egyptian Ministry of Higher Education Scholarship for five years

SPONSORED RESEARCH AWARDS

1. NASA Lewis Research Center, 1980–1983
Numerical Modeling of Turbulent Combustion.
2. National Science Foundation, 1984–1986
Stable and Transient Behavior of Turbulent Premixed Flames.
3. Air Force Office of Scientific Research, 1984-1992
Simulation of Turbulent Flames Using Vortex Dynamics.
4. Air Force Office of Scientific Research, 1984-1985
Vector Computing in Turbulent Combustion.
5. Sloan Basic Research Grant, 1984-1985
Vector Computing in Turbulent Combustion.
6. Department of Energy, 1985-1990
Investigation of Turbulent Flame Propagation and Lean Engine Efficiency.
7. M.I.T. Edgerton Development Fund, 1985-1987
Unrestricted fund.
8. National Science Foundation, 1987-1990
Turbulence-Combustion Interactions in Diffusion Flames.
9. Ford Motor Co, 1988
Application of the Transport Element Method to Engine Combustion.
10. Ford Motor Co, 1990-1994
Numerical Simulation of Engine Intake Flow.

11. G.I.E. PSA-Renault, 1989-1990
Modeling of Flame Propagation in Closed Ducts.
12. National Institute of Standards and Technology, 1990-1993
Numerical Simulation of Dispersion and Deposition of Smoke Plumes.
13. Northwest Fuel Development, 1992-1993
Ultra-Lean Combustion in Gas Turbine.
14. Air Force Office of Scientific Research, 1993-1995
Reaction Zone Models for Turbulent Combustion.
15. Ford Motor Co, 1994-1998
Computation of Turbulent Combustion in Engines.
16. Egyptian Government, 1993-1997
Adaptive Control of Combustion.
17. National Institute of Standards and Technology, 1993-1996
Development of a Computational Model for Large Fire Plumes.
18. Gas Research Institute, 1994-1998
Simulations in Gas Fueled Internal Combustion Engines.
19. General Electric, 1995-1999
Simulation of Turbulent Combustion in High Performance, Low NO_x Engines.
20. Sandia National Laboratory, 1996-1999
Lagrangian Simulation of Radiative Heat Transfer in Large Fires.
21. Department of Energy, 1998–2000
Flame Embedding Techniques for LES of Turbulent Combustion.
22. National Science Foundation, 1998–2002
Active Control of Combustion
23. Office of Naval Research, 1999-2002
Optimal Active Control Strategies for Liquid-Fueled Combustion
24. Department of Energy, 2000–2003
Lagrangian Simulation of Combustion
25. Air Force Office of Scientific Research, 2000–2001
Reduced Order Modeling of Combustion Dynamics
26. Army Research Office, 2001
Equipment Grant, Control of Distributed, Thermal-fluid Processes.
27. Office of Naval Research, 2002-2004
Active Control of Liquid Fueled Combustion
28. SOE Curriculum Development Grant, 2002
Fundamentals of Advanced Energy Conversion
29. Department of Energy, Office of Science, 2003–2007
Lagrangian Simulation of Combustion
30. Office of Naval Research, 2005-2009
Optimal Combustion of Energetic Fuels
31. Department of Energy, University Turbine Systems Research, 2005-2008
Fundamental Studies in Syngas Premixed Combustion Dynamics,
32. Ford Motor Company, 2005-2007
Advance Control Techniques for Complex Engine Technology
33. Office of Naval Research, 2005-2007
Advanced Simulation Methodology for Mixing of Complex Fluids
34. Bosch RTC, 2006-2009
Physics-based Flame Dynamics Modeling & Development of Stability Analysis Tools
35. British Petroleum, 2007-2012
Conversion of High-Carbon/Low-Value Feedstock into Fuel and Electricity: Modeling and Simulations of Mixed Feedstock Gasification and Biomass Torrefaction.

36. Ford Motor Company, 2007-2009
Active Control of After-treatment Systems.
37. ENEL, 2007-2012
Center for Clean Energy Technology: Oxy-coal combustion for carbon Capture, Systems analysis and Optimization and Combustion Simulations.
38. MASDAR Institute Energy Program, 2007-2010
Renewable Energy and Renewable Fuels from Waste; thermochemical Pathways and gasification modeling.
39. KAUST Global Research Partnership, Investigator Award, 2008-2015 (\$10M)
Advanced Energy Conversion Systems Laboratory. Research on Clean Combustion, Dynamics, kinetics and Diagnostics. Carbon Capture using Oxy-combustion, membranes and Hydrogen. Advanced Simulations including uncertainty, and high temperature fuel cells.
40. ENEL, 2008-2010
Integrated Technologies for Renewable Energy Generation in Developing Countries: PV-CSP systems
41. Center of Clean Energy and Clean Water @ MIT and KFUPM, 2008-2014
Oxy-combustion of Natural Gas: ITM Reactor for Carbon capture, thermochemistry, system's analysis and materials
42. Air Force Office of Scientific Research, 2009
Physics-based Control Technologies for Augmentor Screech Suppression, PI.
43. Saudi ARAMCO, 2009-2014
Whole Crude Desulfurization using Supercritical Water Treatment: phase separation, chemistry and high-pressure phenomena
44. BP, 2010-2012
The Global Sustainability Project: The Energy-Water Nexus
45. Center of Clean Energy and Clean Water @ KFUPM and MIT, 2009-2015
Hybrid Concentrated Solar-Fossil Electric Power Generation: Solar Reforming, Thermochemistry and Clean Combustion, and System's Analysis. PI.
46. MASDAR Institute Energy Program, 2010-2013
CO₂ Capture using Chemical Looping Combustion (CLC), system's analysis and reactor modeling, PI.
47. Center of Clean Energy and Clean Water @ KFUPM and MIT, 2010-2012
Development of A School-wide Energy Curriculum, including courses of energy conversion fundamentals and PV systems, PI.
48. Low Carbon Energy University Alliance, 2011-2013
Electrochemical Conversion of De-ashed Coal in Solid Oxide Direct Conversion Fuel Cells, PI.
49. Shell, 2011-2013
High-temperature Membranes for CO₂ capture and Reuse, PI.
50. BP, 2012-2016
Multiscale Modeling of Biomass Conversion, PI.
51. Siemens, 2012-2015
Oxy-fuel Combustion of Sour Gas for EOR, PI.
52. Shell, 2012-2014
Hybrid concentrated solar system for co-generation in developing countries, PI.
53. Tata Center for Technology and Design, 2013-2016
Biomass Torrefaction, Reactor Design and Scaling
54. BP, 2013-2016
CO₂ Separation and Reduction using Ceria-based Thermochemical Cycles.
55. Department of Energy, NETL, 2014-2015 (unspent)
Coal-CO₂ Slurry Feeding System for Pressurized Gasifiers
56. Saudi ARAMCO, 2014-2018

- Production of Chemicals from SCW Treatment of Crude or Refinery Streams.
57. SABIC, 2016-2017
Scaling-up the Use of Ion Transport Membranes in Syngas Production and Oxidative Dehydrogenation of Ethane.
 58. DOE-NETL, 2016-2018
Grid Independence and Uncertainty Quantification in Gas-Solid Flow Simulation
 59. Exelon, 2016-2019
Co-production of Hydrogen and Syngas using Electrolysis, membrane reactors and chemical looping processes
 60. Tata Center for Technology and Design, 2017-2019
Biomass Gasification for Nitrogen-free Syngas Production and Energy Storage
 61. Tata Center for Technology and Design, 2017-2018
Renewable Gas Production from Cavitation-assisted Biomass Anaerobic Digestion
 62. SABIC, 2018-2019
Design and Testing of a Novel Reactor for Combustion Pyrolysis of Methane
 63. Shell, 2018-2020
Oxidative Coupling of Methane using Ion-Transport Membranes
 64. J-WAFS, 2018-2019
Decentralized Biomass Torrefaction for Small-Scale Production of High-Yield, Irrigation-Saving Fertilizer.
 65. FGC Plasma, NASA 2018-2019
Plasma assisted active combustion control
 66. FGC Plasma, DOE 2018-2019
Plasma control of combustion instability
 67. MISTIE Global Fund, 2019
Solar gasification of biomass and waste in a novel integrated system for renewable fuel production (SOLGASBI)
 68. MISTIE Global Fund, 2019
Decentralized biomass torrefaction for small scale high yield production.
 69. BP, 2018-2020
MSW gasification: experimental characterization and reactor modeling
 70. Pratt, 2018-2019
Role of fluid dynamic models in Swirl stabilized combustion simulations
 71. US Agency of International Development 2019-2024 (\$30M)
Center of Excellence in Energy Research and Entrepreneurship

CONSULTING

1. *Ain Shams University in Egypt*, 1984-1987, United States A.I.D.
2. *Cairo University in Egypt*, 1983-1986, United States A.I.D.
3. *Flow Industries Inc.*, Kent, Washington, 1987-1988.
4. *R & D Associates*, Marina del Rey, California, 1987-1989.
5. *Bolt-Beranek and Newmann*, Cambridge, Massachusetts, 1987.
6. *Altex Corporation*, San Jose, California, 1987-1991.
7. *The S.S.P.*, Battelle, for the U.S. Army Atmospheric Sciences Laboratory, 1988-1992.
8. *Allison Gas Turbine Division General Motors Corporation*, 1989-1991.
9. *Shell Oil Company*, Houston, TX, 1989.
10. U.S. Government, *N.I.S.T.*, Center for Fire Research, Washington, D.C., 1989.
11. *General Electric Corporation*, 1988-1993.
12. *Altex Corporation*, San Jose, California, 1981-1995.

13. *Northwest Fuel Development, Inc.*, Portland, Or, 1990-1991.
14. *Chm Michelson Institute*, Norway, 1991.
15. *AMTI*, Newton, MA, 1993.
16. *Hinton and Alfert Law Offices*, Walnut Creek, CA, 1994.
17. *United Technologies*, East Hartford, CT, 1995-98.
18. *Sandia National Laboratories*, Albuquerque, NM, 1995.
19. *Euppi*, Cairo, Egypt, 1997.
20. *United States Golf Association*, Far Hills N.J., 1999.
21. *Radian Tech*, 1998.
22. *United Technology Research Center*, East Hartford, CT, 1998-2001.
23. *Draper Laboratories*, Cambridge, MA, 2000, April-August, 2000.
24. *Delta Search laboratories*, Cambridge, MA, Member of the Board, 2000-.
25. *EXO New Energy*, The Netherlands, 2000-1.
26. *Fish and Anderson Law Offices*, Boston, MA, 2001.
27. *Delta Search lab*, senior scientist 2001-2004.
28. *United Technology Research Center*, 2003-2005.
29. *Mechanology, Inc.*, 2004.
30. *Morrison and Mahoney, LLC*, 2005-2006.
31. *Creare*, 2007.
32. *KAUST*, Technical Advisory Committee 2007-2008.
33. *TECOGEN, Inc.*, MA, member of the Board, 2009-.
34. Chair, IAB for KFUPM Center of Research Excellence in Renewable Energy, 2009-2012.
35. *Ilios Dynamics, Inc.*, MA, member of the Board, 2010-2016.
36. *VALE/VSE*, member of the advisory committee, 2009.
37. *Eurosite Inc.*, member of the board, 2010.
38. *VALE/VEL*, member of the Technical Advisory Committee, 2010-2012.
39. *ARAMCO Research and Development Center, CAC*, 2011-2015.
40. *Babcock-Thermo Clean Combustion LLC*, member of the Board, 2011.
41. *Unity Power Alliance*, member of the Board, 2012.
42. *Alstom Power*, 2014.
43. *UltraTek*, consultant and member of the board, 2015-2017.

PROFESSIONAL ACTIVITIES

1. Member of the Program Subcommittee of the 20th-34th Symposia (International) on Combustion.
2. Member of the Department of Mechanical Engineering, M.I.T., Graduate Committee 1984-1986, Admission Committee, 1987-1992, Curriculum Committee, 1994.
3. Reviewer of papers for Combustion and Flame, Journal of Computational Physics, Journal of Fluid Mechanics, Physics of Fluids, Combustion Science and Technology, AIAA Journals, ASME Journals, Progress in Energy and Combustion Science, Computers in Fluids, International Journal of Computational Methods in Fluids, SIAM Journals, SAE Transactions, International Journal of Computational Fluid Dynamics, and the Reacting Gas Dynamics Colloquia 1985-1991. Reviewer of proposals for the National Science Foundation, Department of Energy, Department of Defense, and Department of Commerce.
4. Invited lecturer and member of panels discussing current research and development in computational fluid dynamics and turbulent reacting flow in conferences and workshops sponsored by NSF, NASA, DOE, DOD, AIAA, ASME, AMS, APS, ARO, Sandia and Los Alamos Laboratories and other institutions in the U.S., Soviet Union, Japan and Europe.
5. Member of the interdisciplinary group for the establishment of the M.I.T. Program on Environmental Engineering Education and Research, 1991-1992.

6. Organized and taught an AIAA professional course on Computational Methods in Combustion; Gas Turbines, Ramjets and Scramjets, 1990, 1993 and 1995. Organized the Propellant and Combustion Sessions (12 sessions) for the 1987 and 1991 AIAA/SAE/ASME/ASEE Joint Propulsion Conferences. Organized sessions of Computational Combustion for the AIAA Aerospace Sciences Meetings 1984-1991. Member of the AIAA Technical Committee on Propellant and Combustion since 1984. Chairman of the AIAA Standard committee on Propellant and Combustion.
7. Visiting professor, Nagoya University, and Institute of Computational Fluid Dynamics, Tokyo, Japan, April 1990.
8. Visiting professor, Lawrence Berkeley Laboratory, University of California, Berkeley, CA, 1990.
9. Member of the National Research Council Committee, Research Directions in Computational Mechanics, 1990-1991.
10. Chairman, *ad hoc* committees on faculty promotion, Mechanical Engineering, M.I.T., 1991.
11. Chairman, Faculty Search and Promotion Committees, 1990-1995.
12. Associate Editor, ASME Journal of Fluids Engineering. 1992-1996.
13. Member of DoE Panel to review funded research on combustion. 1993.
14. Member, Peer Review Panel, NCSA and the Pittsburgh Supercomputer Center. 1993-1996
15. Member of the Committee on Undergraduate Program, (CUP). 1995-1998.
16. Member, User's Advisory Board for the National Computer Science Alliance, NSF, 1999-.
17. Head, Thermal fluids Sciences Division, MIT Mechanical Engineering, 1996 - 2001.
18. Distinguished Visiting Professor, American University in Cairo. Spring 1997.
19. Chair. Committee on Curricula, MIT, 2000-2002-.
20. Member of NERSC, National Energy Research Supercomputing Center Advisory group 2000-2003.
21. Member of Pittsburgh Supercomputer Center Advisory Board 2000-.
22. Member of the MIT Faculty Policy Committee, 2002-2005.
23. Chaired the School of Engineering ME-OE Merger Planning Committee, 2005.
24. Chaired the Energy Search Committee, 2005-6.
25. Chaired the MIT Committee to review Engineering Systems Division, 2005-2007.
26. Head, Energy Science and Engineering Division, ME, 2005-2010.
27. Co-director, then Director of the Center for 21st Century Energy, ME, 2005-2010.
28. Chairman, organizing committee of the Keenan Symposium "Meeting the Entropy Challenge" 2007.
29. Member, Technical Advisory Committee, KAUST, 2007.
30. Member of the Energy Education Task Force, part of the MIT Energy Initiative, 2008-2013.
31. Chaired the MIT MASDAR Institute effort on establishing an Energy Program.
32. Member of the MIT Middle East Studies Working Group, 2008-10.
33. Member of the MIT Task Force on Promotion and Tenure, 2009.
34. Member of the ME Graduate Program Review Committee, 2009-2010.
35. Scientific Director, Cariplo Faculty Exchange Program 2008-2013.
36. Member of the IAB for Oxford Center for Collaborative Applied Mathematics 2008-2013.
37. Mentored six junior faculty in the Department, 2010.
38. Member of the Editorial Board, J. of Applied Mathematics and Computational Science, 2010-
39. Member of the NSE Department Strategic Review Committee 2010.
40. Member of the ME/OE Merger Review Committee 2010.
41. Chair of the Center of Research Excellence in Renewable Energy at KFUPM, 2009-2012.
42. Founding Executive director, Center for Energy and Propulsion Research, 2010.
43. Chair of the Center Advisory Committee of the ARAMCO Research and Development Center 2011-
44. Member, Strategic Planning Committee, ME, 2011.
45. Member, ME Faculty Awards Committee, 2011-2013.
46. Member, Ocean Engineering faculty Search Committee, ME, 2012.
47. Member of the Mechanical Eng. Council, Spring 2012.
48. Visiting Professor, KAUST, Spring 2013.
49. Member of Executive Committee, MIT-KFUPM Center for Clean Energy and Clean Water, 2008-.

50. Energy Faculty search committee, 2013-2014
51. ETH, Evaluation Board, 2013.
52. Co-chair of the Graduate Qualifying Exam, 2014.
53. Environmental Solutions Initiative at MIT, 2015, member of the advisory board.
54. MIT-AFRICA Advisory Committee.
55. Thermal Science Faculty Search, 2016-2017.
56. MITie Energy Faculty Search Committee, 2018-19

PATENTS and DISCLOSURES

1. SWIRL-COUNTER-SWIRL MICROJETS FOR THERMOACOUSTIC INSTABILITY SUPPRESSION. Ahmed F. Ghoniem, Santosh Janardhan Shanbhogue, Zachary Alexander LaBry, and Raymond I. Speth, Patent No.: US 8,708,696 B2. *Approval Jan 2014*)
2. INTEGRATED POLYMERIC-CERAMIC MEMBRANE BASED OXY-FUEL COMBUSTOR. M. A. Habib, K. Mezghani, R. Ben-Mansour, A. F. Ghoniem, Y. Shao-Horn and A. Mitsos, US Patent number 9,004,909. Published 4/14/2015.
3. DEHUMIDIFICATION AND COOLING USING WATER AND ENERGY RECUPERATION. Omar Labban, Tianyi Chen, John H. Lienhard, Leslie K. Norford, and Ahmed F. Ghoniem. US provisional patent application No 62/502,899.
4. ASSEMBLIES AND METHODS FOR REDUCING PARTICULATE MATTER, HYDROCARBONS AND GASEOUS OXIDES FROM INTERNAL COMBUSTION ENGINE EXHAUST. Ahmed F. Ghoniem, Robert Panora, Jean Roy and Joseph Gehret. Provisional Patent Application, attorney docket No. TGEN.USPRO.1000.
5. DUAL STAGE INTERNAL COMBUSTION ENGINE AFTERTREATMENT SYSTEM USING EXHAUST GAS INTERCOOLING (EGI) AND FORCED CHARGER-DRIVEN AIR EJECTOR. Ahmed F. Ghoniem, Robert Panora, Jean Roy and Joseph Gehret. Provisional Patent Application. TGEN_USPAT_1100.
6. BIOMASS TORREFACTION REACTOR. Kevin Kung, Santosh Shanbhogue, Alex Slocum, Robert Stoner and Ahmed F Ghoniem. U.S. Patent Application No.:62/506716, May 2017.
7. DUAL STAGE INTERNAL COMBUSTION ENGINE AFTERTREATMENT SYSTEM USING COMMON RADIATOR COOLING FLUID CIRCUITS FOR EXHAUST GAS INTERCOOLING AND CHARGE-DRIVEN EJECTOR

JOURNAL PUBLICATIONS

1. Kamel, M. M., Ghoniem, A. F., Rashed, M. I., and Oppenheim, A.K., Blast waves in real gases, *Acta Astronautica*, 4, pp. 439-458, 1977.
2. Ghoniem, A.F., Chorin, A. J., and Oppenheim, A. K., Numerical modeling of turbulent combustion in premixed gases, *18th Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, PA*, pp. 1375-1383, 1981.
3. Keller, J. O., Vaneveld, L., Krochlet, D., Hubbard, G. L., Ghoniem, A. F., Daily, J. W., and Oppenheim, A. K., Mechanisms of instabilities leading to flash back, *AIAA Journal*, 20, pp. 254-262, 1982.
4. Ghoniem, A. F., Kamel, M. M., Berger, S. I., and Oppenheim, A. K., Self-similar blast waves with internal heat transfer, *Journal of Fluid Mech.*, 117, pp. 463-491, 1982.
5. Ghoniem, A. F., Chorin, A. J., and Oppenheim, A. K., Numerical modeling of turbulent flow in a combustion tunnel, *Phil. Trans. Roy. Soc. London*, A304, pp. 303-325, 1982.
6. Ghoniem, A. F. and Oppenheim, A. K., Numerical solution of the problem of flame propagation by the use of the random element method, *AIAA Journal*, 22, pp. 1429-1435, 1984.

7. Hsaio, C. C., Ghoniem, A. F., Chorin, A. J., and Oppenheim, A. K., Numerical simulation of a turbulent flame stabilized behind a rearward-facing step, *The 20th Symposium (International) on Combustion*, The Combustion Institute, Pittsburgh, PA, pp. 494-504, 1985.
8. Ghoniem, A. F. and Sherman, F. S., Grid-free simulation of diffusion using random walk, *J. Comput. Phys.*, 61, pp. 1-37, 1985.
9. Ghoniem, A. F., Chen, D. Y., and Oppenheim, A. K., Formation and inflammation of a turbulent jet, *AIAA Journal*, 24, pp. 224-229, 1986.
10. Ghoniem, A. F., Effect of large scale structures on turbulent flame propagation, *Combust. Flame*, 64, pp. 321-336, 1986.
11. Ghoniem, A.F., and Knio, O.M., Numerical simulation of flame propagation in constant volume chambers, *the 21st Symposium (International) on Combustion*, the Combustion Institute, Pittsburgh, PA, 1986, pp. 1313-1320.
12. Ghoniem, A. F. and Gagnon, Y., Vortex simulation of laminar recirculating flow, *J. Computational Phys.*, 68, pp. 346-377, 1987.
13. Ghoniem, A. F. and Sethian, J. A., Dynamics and structure of recirculating flow, *AIAA Journal*, 25, pp. 168-171, 1987.
14. Ghoniem A. F., and Ng, K. K., Numerical study of the dynamics of a forced shear layer, *Physics Fluids*, 30, pp. 706-721, 1987.
15. Sethian, J. A., and Ghoniem, A. F., Validation of the vortex method, *J. Computational Phys*, 74, pp. 283-317, 1988.
16. Ghoniem, A.F. and Krishnan, A., Origin and manifestation of flow-combustion interactions in a premixed shear layer, *The 22nd Symposium (International) on Combustion*, the Combustion Institute, Pittsburgh, PA, 1988, pp. 665-675.
17. Ghoniem, A.F., Heidarinejad, G. and Krishnan, A., Numerical simulation of a thermally stratified shear layer using the vortex element method, *J. Computational Phys*, 79, pp. 135-166, 1988.
18. Ghoniem, A.F., and Givi, P., Lagrangian simulation of a reacting shear layer at low heat release, *AIAA Journal*, 26, pp. 690-697. 1988.
19. Ghoniem, A.F., Knio, O.M., and Krishnan, A., Lagrangian simulation of the early stages in a reacting jet, *the 23rd Symposium (International) on Combustion*, The Combustion Institute, Pittsburgh, PA, pp. 699-705, 1990.
20. Knio, O.M. and Ghoniem, A.F., Numerical study of a three-dimensional vortex method, *J. Comput. Phys.*, 86, pp. 75-106 (1990).
21. Ghoniem, A. F. and Heidarinejad, G., Effect of Two-Dimensional Shear Layer Dynamics on Mixing and Combustion at Low Heat Release, *Combust. Sci. and Tech.*, Vol. 72, pp. 79-99, March 1990.
22. Ghoniem, A.F., and Heidarinejad, G., Effect of Damkohler number on the reaction zone in a reacting shear layer, *Combust. Flame*, 83, pp. 1-17, 1991.
23. Najm, H. and Ghoniem, A.F., "Vortex simulation of the convective instability in a dump, *AIAA Journal*, 29, 6, pp. 911-919, 1991.
24. Knio, O.M. and Ghoniem, A.F., Three-dimensional vortex simulation of roll-up and entrainment in a shear layer, *J. Computational Phys.*, 97, pp. 172-223, Nov. 1991.
25. Martins, L.-F. and Ghoniem, A.F., Vortex simulation of the intake flow in a planar piston-chamber device, *Int. J. for Num. Meth. in Fluids*, 12, pp. 237-260, 1991.
26. Ghoniem, A.F., Soteriou, M.C. and Knio, O.M. Effect of steady and periodic strain on unsteady flamelet combustion, *Proceedings of the 24th Symposium (International) on Combustion*, July 5-10, 1992, the Combustion Institute, Pittsburgh, PA, 1992, pp. 223-230.
27. Knio, O.M., and Ghoniem, The three-dimensional structure of periodic vorticity layers under non-symmetric conditions, *J. Fluid Mech.*, Vol. 243, pp. 353-392, Nov 1992.
28. Krishnan, A. and Ghoniem, A.F., Simulation of the roll-up and mixing in Rayleigh-Taylor flow using the vortex/transport element method, *J. Computational Phys.*, 99, 1992, pp. 1-27.

29. Ghoniem, A.F. and Martins, L.-F., Effect of the velocity ratio on the wake flow behind an axisymmetric bluff-body, *AIAA Journal*, 30, No 8, August 92, pp. 2166-2168.
30. Knio, O.M. and Ghoniem, A.F., Vortex Simulation of a Three-Dimensional Reacting Shear Layer with Infinite-Rate Kinetics, *AIAA Journal*, 30, pp. 474-484, January 1992.
31. Ghoniem, A.F., Zhang, X.M., Knio, O.M., Baum, H.R. and Rehm, R.G., Dispersion and deposition of dense smoke plumes resulting from massive fires, *J. Hazardous Materials*, 1992, 33, 275-293 (1993).
32. Martins, L.-F., and Ghoniem, A.F., Numerical simulation of the non-reacting flow in a bluff-body burner; effect of the diameter ratio, *ASME, J. Fluid Eng.*, 115, pp.474-484, 1993.
33. Zhang, X.M. and Ghoniem, A.F., A computational model for the rise and dispersion of wind-blown, buoyancy-driven plume, Part I: Neutrally stratified atmosphere, *Atmospheric Environment*, 27A, 15, pp. 2295-2311 (1993).
34. Najm, H., and Ghoniem, A.F., Modeling pulsating combustion due to the flow-flame interactions in vortex stabilized pre-mixed flames, *Combust Sci. Tech*, 1993, 94, 259-178, 1993.
35. Zhang, X.M. and Ghoniem, A.F., A computational model for the rise and dispersion of wind-blown, buoyancy-driven plumes, Part II: Linearly stratified atmosphere, *Atmospheric Environment*, Vol. 28, No. 18, pp. 3005-3018, 1994.
36. Zhang, X.M. and Ghoniem, A.F., A computational model for the rise and dispersion of wind-blown, buoyancy-driven plumes, Part III: Inversion Layer, *Atmospheric Environment*, Vol. 28, No. 18, pp. 3019-3032, 1994.
37. Najm, H. and Ghoniem, A.F., Coupling between vorticity and pressure oscillations in combustion instability, *AIAA J. Propulsion and Power*, Vol. 10, No. 6, pp. 769-772, Nov.-Dec. 1994.
38. Soteriou, M.C. and Ghoniem, A.F., Vorticity dynamics of an exothermic spatially developing, forced, reacting shear layer, Proceedings of the *25th Symposium (International) on Combustion*, The Combustion Institute, pp. 1265-1272, 1995.
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70. Dimirtakopoulos, G. and Ghoniem, A.F., Methane partial oxidation and reforming to syngas using LCF mixed conductor, 2017 AICHE Annual Meeting, Oct 29-Nov 3, 2017, Minneapolis MN.

71. Ragavan, A. and Ghoniem, A.F., 2017 AICHE Annual Meeting, Oct 29-Nov 3, 2017, Minneapolis MN.
72. X.Y. Wu and A.F. Ghoniem, "Kinetics and Material Stabilities for Membrane-Supported H₂O/CO₂ Splitting", *2017 MRS Fall Meeting & Exhibit*, Boston, 2017
73. Zhao, ZL, Uddi, M, Tsvetkov, N, Yildiz, B. and Ghoniem, A.F., Enhanced intermediate temperature CO₂ splitting using non-stoichiometric ceria and ceria zirconia, 232nd ECS Meeting, Oct 1-5, 2017, National Harbor, MD.
74. Dagan, Y. and Ghoniem, A.F Impact of finite rate chemistry on hydrodynamic instability of shear flows in turbulent lean premixed combustion, for presentation at the APS-DFD, Denver, CO, Nov 2017.
75. Long, A., Speth, R, Ghoniem, A.F. and Green, W., Ember: an open source transient reacting flow solver with applications in turbulent flames and strained extinction, 2018 AICHE Annual Meeting.
76. Wu, X.Y. and Ghoniem, A.F., 2018 AICHE Annual Meeting.
77. Ghoniem, A.F., ASME Congress and Exhibition, Invited Plenary Lecture, 2018.

INVITED LECTURES

Hundreds of invited talks on the fundamentals of energy, computational fluid dynamics, turbulent reacting flows, flow and combustion control, fuel cells, carbon capture technologies including gasification and oxy-combustion, oxygen separation using membranes and thermochemical looping, solar energy and hybridization, reforming and syngas productions. Talks were presented at universities, industrial and government laboratories, specialists' meetings and panels in the United States, France, Canada, Italy, the Soviet Union, Spain, Portugal, Germany, United Kingdom, Japan, Norway, Lebanon, Australia, Russia, India, Malaysia, Saudi Arabia, Turkey, Abu Dhabi, Egypt, South Korea, China, Austria, Brazil, Kuwait, Poland and Switzerland.

THESES AND INDIVIDUALS SUPERVISED

M.Sc.

1. **Omar Knio**, Professor, Duke University and KAUST
Low-Mach Number Modeling of Flame Propagation in a confined Volume.
2. **Yves Gagnon**, Professor, University of Moncton, Canada
Numerical Investigation of Recirculating Flow at Low and Moderate Reynolds Numbers.
3. **K.K. Ng**
Vortex Simulation of a Confined, Perturbed Mixing Layer.
4. **A. Dickinson**
Computation of the Forces and Far-Field Sound Radiation from an Unsteady Two-Dimensional Airfoil Using the Vortex Method.
5. **Thomas Bress**
Effect of Squish and Swirl on Turbulent Flame Propagation.
6. **Antony Loprinzo**
Numerical Simulation of Turbulent Jet Diffusion Flames
7. **V. Venkatesh**
Thermal Design and Analysis of A Recuperative Combustor for Gas-Turbine Combustion
8. **Constantine Petrov**, Fidelity Investment
Numerical Model of Unsteady Strained Flame
9. **J.C. Saghbini**, Cardinal Health (WaveMark)
Simulation of Vorticity Dynamics in Swirling Flows, Mixing & Vortex Breakdown

10. **Aaron Golub**, Associate Professor, Arizona State University
Predicting NO and CO Emissions in Lean Natural Gas Spark Ignition Engines.
11. **Youssef Marzouk**, associate professor, MIT
The Effect of Flow and Mixture in Homogeneity on the Dynamics of Strained Flames
12. **Sungbae Park**, VP for Engineering, Bosch
Modeling of Combustion Instability at Different Damkohler Conditions
13. **Daehyun Wee**, Ewaha Woman's University
Stability Analysis and Reduced Order Modeling of a Separating Shear Flow
14. **Adam Wachsmann**, BEA Systems
Experimental Verification of Model-Based Control Strategies Using a Backward-Facing Step Combustor.
15. **Murat Altay**, Bosch
Vortex Driven Flame Dynamics and Combustion Instability
16. **Raymond Speth**, research scientist, MIT
Effects of Curvature and Strain on a Lean Premixed Methane-Hydrogen-Air Flame.
17. **Won Yong Lee**, Samsung Corporate Research Labs
Modeling of Solid Oxide-Fuel Cells.
18. **Fabrice Shlegel**, COMSOL
A Fast 3-D Particle Method for Simulations of Buoyant and Reacting Flows.
19. **Duane Hudgins**, graduate student at ETH.
Suppression of Premixed Combustion Dynamics Utilizing Microjet Air Injection
20. **Jongsup Hong**, Korea Institute of Science and Technology
Techno-Economic Analysis of Pressurized Oxy-Fuel Combustion Power Cycle for CO₂ Capture.
21. **Addison Stark**, ARPA-E
Multi-Criteria Lifecycle Evaluation of Transportation Fuels Derived from Biomass Gasification
22. **Kushal Sharad Kedia**, ExxonMobile
Numerical Simulations of Perforated Plate Stabilized Premixed Flames with Detailed Chemistry
23. **Sze Zheng Yong**, junior faculty, Arizona State University
Multiphase Models of Slag Layer Built-up in Solid Fuel Gasification and Combustion
24. **Zach LaBry**, Escape Dynamics
Suppression of Thermoacoustic Instabilities in a Swirl Combustor through Microjet Air Injection.
25. **Anna Vasilyeva**
A Mesh-Free Method for the Poisson Equation for 3D Wall-Bounded Flow Applications
26. **Chuckwunwike Ogbonnia Iloeje** Argonne National lab
Process Modeling and Analysis of CO₂ Purification for Oxy-Coal Combustion
27. **Alex J Chapman**, Ampaire, LA
Biomass Characterization and Reduced Order Modeling of Mixed-Feedstock Gasification
28. **Andrew P Shroll**, Caterpillar
Dynamic Stability, Blow-off, And Flame Characteristics of Oxy-Fuel Combustion
29. **Daniel Apo**, Founder, ESiMi
Experimental Characterization of an Ion-Transport Membrane (ITM) Reactor For Methane Oxy-Fuel Combustion
30. **Richard Bates**, McKinsey
Modeling The Coupled Effects of Heat Transfer, Thermochemistry and Kinetics During Biomass Torrefaction
31. **Zhenlong Zhao**, ExxonMobile
Rotary-Bed Reactor for Chemical-Looping Combustion with Carbon Capture
32. **Michael Rutberg**, senior technologist at TIAX
Modeling Water Use at Thermoelectric Power Plants
33. **Ashwin Raghavan**, Ph.D. student at MIT

- Simulations of Supercritical Water-Hydrocarbon Mixing at intermediate Reynolds Number: Impact Thermodynamic and Transport Property Variations
34. **Tianjiao Chen**, ATA Engineering, CT
Experimental Characterization and Chemical Kinetics Study of Chemical Looping Combustion
 35. **Le Chang**, Microsoft
High Temperature Ceramic Membrane for CO₂ Reuse and Syngas Production
 36. **Nadim Chakroun**, Ph.D. Student at MIT
Sour Gas Oxy-combustion Power Cycles for Carbon capture and Sequestration
 37. **Dominik Bongartz**, Ph.D. student, Aachen
Chemical Kinetics Modeling of Oxy-fuel Combustion of Sour Gas for Enhanced Oil Recovery
 38. **Rajesh Sridhar**, Impact Analytics
Chemistry models for predicting major gas species and tar formation in fluidized bed biomass reactors.
 39. Yudong Chen (September 2017)
Membranes for hydrogen production ..
 40. Aniket Patankar (September 2017)
Supercritical fluids and upgrade ...
 41. Yan Yan (September 2017)
Biomass gasification for nitrogen free syngas
 42. Cody Jacobucci (September 2017)
Anaerobic digestion for biogas production

Ph.D.

1. **Y.W. Dai**, professor, China (Ph.D. granted at UCB)
Numerical Modeling of Turbulent Flow in a Channel
2. **C.C. Haiso**, SRI (Ph.D. granted at UCB)
Combustion Jet Ignition
3. **Habib Najm**, Sandia National Laboratories.
Numerical Study of the Convective Instability of Turbulent Flames in a Dump Combustor
4. **Ghassem Hiedarinejad** (June 1989), professor in Iran
Numerical Simulation of a Reacting Shear Layer Using the Transport Element Method
5. **Anantha Krishnan**, Lawrence Livermore National Labs
Turbulence-Combustion Interactions in a Premixed Flame
6. **Luis F. Martins**, Fidelity Investment
A Hybrid Finite Element-Vortex Simulation for Flow in an Internal Combustion Engine
7. **Omar Knio**, professor at KAUST
Streamwise and Spanwise Structures in a Turbulent Mixing Layer
8. **Gerard Payen**, Renault (granted at U. of Rouen)
Development of a 2-d Computational Tool based on a Hybrid Random Vortex Method for the Time-Resolved Analysis of Viscous Bounded Incompressible Flows
9. **Marios Soteriou**, Fellow at United Technology Research Center.
Numerical Study of Turbulent Combustion in A Shear Layer
10. **Xiaoming Zhang**, Systems Analysis, Waltham.
A Computational Analysis for the Rise, Dispersion and Deposition of Buoyant Plume
11. **Adrin Gharakhani**, Professor, Claremont Graduate University, CA.
A 3-D Vortex Boundary Element Method for the Simulation of Unsteady, High Reynolds Number Flows
12. **Van Luu**, McDonnell Douglas.
Numerical Study of the Reactive Flow in a Two Stream, Coaxial-Jet, Axisymmetric Bluff-Body Combustor
13. **Constantine Petrov**, Fidelity Investment.

- Numerical Simulation of Reacting Flows with Complex Chemistry Using Flame Embedding
14. **Mahmoud Fleifil**, GE Aircraft Engines (Ph.D. granted by Ain Shames U.)
Numerical Study of the Reactive Flow in a Two Stream, Coaxial-Jet, Axisymmetric Bluff-Body Combustor
 15. **Mostafa Abdel Kkalek Mostafa**, Assistant Prof, (Ph.D. granted at Ain Shames U.)
Numerical Simulation of Acoustic Effect on the Stability of a Lean Premixed Combustor
 16. **Issam Lakkis**, associate professor, American University of Beirut
Lagrangian Computations of Radiating Fire Plumes
 17. **Jean-Pierre Hathout**, President at SiT Control USA, Charlotte NC.
Modeling and Control of Combustion Instability
 18. **Youssef Marzouk**, Associate professor at MIT Aero Astro.
Vorticity Dynamics and Control of Mixing in a Transverse Jet
 19. **Sungbae Park**, VP for Engineering, Bosch.
Active Combustion Control, Modeling, Design and implementation
 20. **Daehyun Wee**, assistant professor, Ewha Woman's University, South Korea.
Lagrangian Simulation of Transverse Jets with a Distribution-Based Diffusion Scheme
 21. **H. Murat Altay**, Bosch, Izmir, Turkey.
Physics-Based Flame Dynamics Modeling and Thermo-acoustic Instability Mitigation
 22. **Rory Monaghan**, lecturer, University of Galway.
Dynamic Reduced Order Modeling of Entrained Flow Gasifiers
 23. **Raymond Speth**, research scientist at MIT
Fundamental Studies in Hydrogen-Rich Combustion: Instability Mechanisms and Dynamic Mode Selection
 24. **Mayank Kumar**, assistant professor, IIT Delhi
Multiscale CFD Simulations of Entrained Flow Gasification
 25. **Fabrice Schlegel**, AMGEN, Boston USA.
Hybrid Eulerian/Lagrangian 3D methods for high Reynolds number reactive flows
 26. **Simcha Singer**, assistant professor at Marquette University
Gasification and Combustion Modeling for Porous Char Particles
 27. **Won Yong Lee**, Samsung Advanced Institute of Technology, South Korea.
Mathematical Modeling of Solid Oxide Fuel Cells using Hydrocarbon Fuels
 28. **Lei Chen**, SABIC, Houston USA.
CFD Simulations of Oxy-Coal Combustion for Carbon Capture at Atmospheric and Elevated Pressures
 29. **Jongsup Hong**, assistant professor, Yonsie University, South Korea.
Numerical Simulation of Ion Transport Membrane Oxy-Fuel Reactors for CO₂ Capture Applications.
 30. **Cristina Botero**, Tesla, NV.
The Phase Inversion-based Coal-CO₂ Slurry (PHICCOS) Feeding System: Design, Coupled Multiscale Analysis and Techno-Economic Assessment
 31. **Kushal Sharad Kedia**, ExxonMobil, Houston USA
Development of a Multiscale Projection Method with Immersed Boundaries for Chemically Reactive Flows and its Application to Examine Flame Stabilization and Blow-off Mechanisms
 32. **Seunghyuck Hong**, GE Global Research
Towards Predicting Dynamics in Turbulent Premixed Combustion Using PIV-PLIF Measurements of Flow-Flame Microstructures
 33. **Gaurav Kewlani**, post doctor at MIT
Large-Eddy Simulation of Premixed Turbulent Flame Dynamics: Combustion Modeling, Validation and Analysis
 34. **Zachery LaBry**, ATA Engineering
Turbulent Flame Microstructure, Dynamics and Thermo-acoustic Instability in Swirl-Stabilized Premixed Combustion; Measurements, Statistics and Analysis

35. **Addison Stark**, Bipartisan Policy Center, D.C.
Multi-scale Chemistry Modeling of Biomass Gasification in a Fluidized Bed Reactor
36. **Anton Hunt**, Shell
Experimental investigation of oxygen-separating ion transport membranes for clean fuel synthesis.
37. **Elysia Sheu**, Shell
A Solar Reforming System for Use in Hybrid Solar-Fossil Fuel Power Generation.
38. **Sofien Taamallah**, ONERA
Impact of Fuel and Oxidizer Composition on Premixed Flame Stabilization in Turbulent Swirling Flow: Dynamics and Scaling
39. **Kathrine Ong**, assistant professor, University of Pittsburgh
Modeling of Solid Oxide Fuel Cell Performance with Coal Gasification
40. **Chuckwunwike O. Iloeje**, post-doctoral fellow, Argonne National Labs
Rotary (redox) Reactor Based Power Cycles for Oxy-combustion with Carbon Capture; Design, Analysis and Optimization
41. **Zhenlong Zhao**, ExxonMobile
Redox Kinetics Study for Chemical-looping Combustion, Water and CO₂ Splitting using Nickel and Cerium-based Oxygen Carrier
42. **Richard Bates**, McKinsey Consulting
Multiscale simulation of methane assisted fluidized bed gasification of biomass
43. **Georgios Dimitrakopoulos**, post-doctoral associate at MIT
Experimental Study and Modeling Analysis of Ion-Transport Membranes for Methane Partial Oxidation and Oxy-fuel Combustion
44. **Akhilesh Bakshi**, ENEL X
Multiscale Continuum Simulations of Fluidization: Bubbles, Mixing Dynamics and Reactor Scaling
45. **Xiaoyu Wu**, post-doctoral associate at MIT
Membrane Supported Hydrogen/Sygas Production Using Reactive H₂O/CO₂ Splitting for Energy Storage
46. **Kevin Kung**, post-doctoral associate at MIT
Design and validation of a decentralized biomass torrefaction system
47. **Nadim Chakroun**, United Technology
Dynamics, Stability and Scaling of Turbulent Methane Oxy-Combustion
48. **Ashwin Raghavan**, Exxon
Multiscale modeling tools for coupled reaction, phase equilibrium and two phase mixing phenomena with application to supercritical heavy oil upgrading process

Post-doctoral Associates

1. **Omar Knio**, professor, KAUST
2. **Marios Soteriou**, fellow, UTRC
3. **Adrin Gharakhani**, Professor, Claremont Graduate University
4. **Mahmoud Fleifil**, GE Aircraft Engines
5. **S. Shankar**, Quantum
6. **Jean Christophe Nave**, Professor, McGill University
7. **Issam Lakkis**, professor, American University of Beirut
8. **Isam Janajreh**, associate professor, Masdar Institute
9. **Cheng Zhang**, assistant professor, Georgia Southern University
10. **Santosh Shanbhogue**, research scientist at MIT
11. **Anup Shirgaonkar**, data Scientist at Amazon
12. **Seyed-Abdolreza Seyed-Reihani**, (formed his own company)
13. **Yixiang Shi**, Associate Professor at Tsinghua University
14. **Patrick Kirchen**, Assistant professor at UBC
15. **Hossam El-Asrag**, ANSYS

16. **Sadegh Dabiri**, Assistant Professor at Purdue University
17. **Neerav Abani**, John Deere
18. **Guang Wu**, Lead Engineer, GE Global Research
19. **Konstantina Vogiatzaki**, senior lecturer, University of Brighton
20. **Mruthunjaya Uddi**, assistant professor, University of Alabama
21. **Yousef Haseli**, assistant professor, Western New England University
22. **Jeffrey Hanna**, York School, Monterey, CA
23. **Seunghyuck Hong**, GE Global Research
24. **Ping He**, Assistant professor, Lamar University
25. **Noura Mansouri**, KAPSARC, KSA
26. **Christos Altantzis**, Swiss Re
27. **Khulood Rambo**, Assistant Professor, King Abdel Aziz University
28. **Dan Micheals**, junior faculty, Technion.
29. **Kevin Kung**, Cyclotron Rd Fellow, LBNL
30. **Akhilesh Bakshi**, ENEL X
31. **Georgios Dimitrakopoulos** (started January 2017)
32. **Yuval Dagan** (started March 2017)
33. **Xiaoyu Wu** (started June 2017)
34. **Sonal Thengane** (started Nov 2018)
35. **Bonjae Koo** (started March 2019)
36. **BP** (April 2019)

Research Scientists

1. **Anuradha Annaswamy**, senior research scientist at MIT
2. **Patrick Kirchen**, assistant professor at UBC
3. **Mruthunjaya Uddi**, assistant professor, University of Alabama
4. **Ping He**, assistant professor, Lamar University
5. **Santosh Shanbhogue** at MIT

Recent Visiting Scholars/Students

1. **Gian Paolo Beretta**, professor, University of Brescia
2. **Matteo Gazzani**, Ph.D. student, Politecnico de Milano
3. **Tariq Shamim**, professor, Michigan State and MASDAR Institute
4. **Paolo Iora**, assistant professor, University of Brescia and Polytechnic Institute of Milano
5. **Fahad Alzahrani**, KFUPM, Saudi Arabia
6. **Marco Astolfi**, Ph.D. student, Polytecnico de Milano
7. **Bing Liu**, Ph.D. student, Tsinghua University, China
8. **Jose Sierra Pallares**, assistant professor, University of Valladolid, Spain
9. **Medhat Nemitallah**, KFUPM, Saudi Arabia
10. **Kaylan Annamalai**, professor, Texas A&M.
11. **Davide Turi**, Ph.D. student, Politecnico de Milano
12. **Shahd Labib**, AUC, Egypt
13. **Hirotsu Watanabe**, associate professor, Tokyo Institute of Technology
14. **Yinka Sanusi**, Ph.D., student, KFUPM
15. **Mohammad Khan**, Ph.D. student, Masdar Institute
16. **Marc Vetter**, ETH
17. **Rishav Choudhary**, IIT Kanpour
18. **Masayasu Shimura**, associate professor, Tokyo Institute of Technology
19. **Byung-Chul Choi**, Korean Board of Shipping
20. **Noura Mansouri**, KAPSARC
21. **Maria Carmen Jimenez Sanchez**, Madrid

22. **Giancarlo Gentile**, Politecnico de Milano
23. **Yu Luo**, Fuzhou University
24. **Daehyun Wee**, Lecturer, Ewha University
25. **Abdul Raouf Tajik**, Ph.D. student, Masdar Institute
26. **Jose Rodrigues**, Ph.D. student, Instituto Superior Tecnico, Portugal
27. **Joao Pirez**, Ph.D. student, Instituto Superior Tecnico, Portugal
28. **Chenshu Hu**, Ph.D. student, Zhejiang University
29. **Alberto Gomez-Barea, (Feb 2019)** Professor of Chemical Engineering, U of Seville