

## Dr. Mohamed Gad-el-Hak Biographical Sketch

**Mohamed Gad-el-Hak** received his B.Sc. (summa cum laude) in mechanical engineering from Ain Shams University in 1966 and his Ph.D. in fluid mechanics from The Johns Hopkins University in 1973, where he worked with Professor Stanley Corrsin. (Corrsin's graduate advisors at Caltech were Hans W. Liepmann and Theodore von Kármán. The latter's doctoral advisor at Göttingen was Ludwig Prandtl.) Gad-el-Hak has since taught and conducted research at the University of Southern California, University of Virginia, University of Notre Dame, Institut National Polytechnique de Grenoble, Université de Poitiers, Friedrich-Alexander-Universität Erlangen-Nürnberg, Technische Universität München, Technische Universität Berlin, Brandenburgische Technische Universität Cottbus, and Université de Valenciennes, and has lectured extensively at seminars in the United States and overseas. Dr. Gad-el-Hak is currently the Inez Caudill Eminent Professor of biomedical engineering and professor of mechanical & nuclear engineering at Virginia Commonwealth University in Richmond. From 2002 to 2009, Gad-el-Hak was the chair of mechanical engineering at VCU. Prior to his Notre Dame appointment as professor of aerospace and mechanical engineering, Gad-el-Hak was senior research scientist and program manager at Flow Research Company in Seattle, Washington, where he managed a variety of aerodynamic and hydrodynamic research projects. Gad-el-Hak wrote extensively for the popular press on issues relevant to education and research.

Professor Gad-el-Hak is world renowned for advancing several novel diagnostic tools for turbulent flows, including the laser-induced fluorescence technique for flow visualization; for discovering the efficient mechanism via which a turbulent region rapidly grows by destabilizing a surrounding laminar flow; for conducting the seminal experiments that detailed the fluid-compliant surface interactions in turbulent boundary layers; for introducing the concept of targeted control to achieve drag reduction, lift enhancement, noise suppression, and mixing augmentation in wall-bounded flows; and for developing a novel viscous pump suited for microelectromechanical systems (MEMS) applications. Gad-el-Hak's work on Reynolds number effects in turbulent boundary layers, published in 1994, marked a significant paradigm shift in the subject. His 1999 paper on the fluid mechanics of microdevices established the fledgling field on firm physical grounds and, at 1,626 citations, is one of the most cited articles of the 1990s. Gad-el-Hak's recent work on large-scale disasters resulted in the establishment of a universal metric by which the severity of *all* natural and manmade disasters is measured.

Gad-el-Hak holds two patents: one for a drag-reducing method for airplanes and underwater vehicles, and the other for a lift control device for delta wings. Dr. Gad-el-Hak has published over 645 articles, authored/edited 20 books and conference proceedings, and presented over 313 invited lectures in the basic and applied research areas of isotropic turbulence, boundary layer flows, stratified flows, fluid-structure interactions, compliant coatings, unsteady aerodynamics, biological flows, non-Newtonian fluids, hard and soft computing including genetic algorithms, reactive flow control, and microelectromechanical systems. Gad-el-Hak's papers have been cited (as of July 2021) more than 16,315 times in the technical literature, and his h-index is 58, i10-index is 147, and i100-index is 32. Two of Gad-el-Hak's books have been translated into Chinese, and several of his articles/essays have been translated into Arabic, Chinese, the Czech language, French, German, Japanese, Russian, Spanish, and Turkish. Gad-el-Hak is the author of the book *Flow Control: Passive, Active, and Reactive Flow Management*, and editor of the books *Frontiers in Experimental Fluid Mechanics*, *Advances in Fluid Mechanics Measurements, Flow Control: Fundamentals and Practices*, *The MEMS Handbook* (first and second editions), *Transition and Turbulence Control*, and *Large-Scale Disasters: Prediction, Control and Mitigation*.

Professor Gad-el-Hak is a fellow of the American Academy of Mechanics, American Association for the Advancement of Science, American Institute of Physics, American Physical Society, and American Society of Mechanical Engineers. He has recently been inducted as an eminent engineer in Tau Beta Pi, an honorary member in Sigma Gamma Tau and Pi Tau Sigma, and a member-at-large in Sigma Xi. Dr. Gad-el-Hak served as associate editor of *Applied Mechanics Reviews* (1988–2012) and *AIAA Journal* (1988–1991). He is currently serving as editor-in-chief of *e-MicroNano.com*; associate editor of *e-Fluids*; editorial advisor to *Bulletin of the Polish Academy of Sciences*, *International Journal of Flow Control*, *CFD Letters*, and *International Journal of Aerospace Engineering*; and contributing editor to Springer-Verlag's *Lecture Notes in Engineering* and *Lecture Notes in Physics*, McGraw-Hill's *Year Book of Science & Technology*, and *Encyclopedia of Science & Technology*, and CRC Press's *Mechanical Engineering Series*.

Dr. Gad-el-Hak served as a member of the Executive Committee of the Faculty Senate at the University of

Notre Dame, member of the University Committee on Patents, chair of the Benefits Committee, and chair of the University Governance Committee. He serves as consultant to the governments of Algeria, Brazil, China, Egypt, France, Germany, India, Italy, Poland, Singapore, Sweden, and the United States; the United Nations; and numerous industrial and academic organizations. Professor Gad-el-Hak has been a member of several advisory panels for the U.S. Department of Defense, the U.S. Department of Energy, the National Aeronautics and Space Administration, and the National Science Foundation.

During the 1991/1992 academic year, he was a visiting professor at Institut de Mécanique de Grenoble, France. During the summers of 1993, 1994, and 1997, Dr. Gad-el-Hak was, respectively, a distinguished faculty fellow at Naval Undersea Warfare Center, Newport, Rhode Island; a visiting exceptional professor at Université de Poitiers, France; and a Gastwissenschaftler (guest scientist) at Forschungszentrum Rossendorf, Dresden, Germany. In 1998, Professor Gad-el-Hak was named the Fourteenth ASME Freeman Scholar. In 1999, Gad-el-Hak was awarded the prestigious Alexander von Humboldt Prize—Germany’s highest research award for worldwide scientists and scholars in all disciplines—as well as the Japanese Government Research Award for Foreign Scholars. In 2002, Gad-el-Hak was named ASME Distinguished Lecturer, as well as inducted into The Johns Hopkins University Society of Scholars. In 2016, he was awarded the ASME Medal for seminal contributions to the discipline of fluids engineering. In the same year, Gad-el-Hak also received an ASME certificate of appreciation in testimony of the high regard of his associates and the deep appreciation of the society for his valued services in advancing the engineering profession.

To honor Professor Gad-el-Hak, six academicians from three countries penned the editorial “Homage to a Legendary Dynamicist on His Seventy-Fifth Birthday”. The article appeared in the July 2020 issue of the *Journal of Fluids Engineering*. <https://www.people.vcu.edu/~gadelhak/Homage.pdf>

## Related URLs

**Home Page:** <https://www.people.vcu.edu/~gadelhak/>

**Wikipedia:** [https://en.wikipedia.org/wiki/Mohamed\\_Gad-el-Hak](https://en.wikipedia.org/wiki/Mohamed_Gad-el-Hak)

**Google Scholar:** <https://scholar.google.com/citations?user=OEHeMUKAAAAJ&hl=en&oi=ao>

**Google Search:** <https://www.google.com/search?client=firefox-b-1-d&q=Mohamed+Gad-el-Hak>

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# Résumé

## Dr. Mohamed Gad-el-Hak

### Work Address

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Virginia Commonwealth University  
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E-Mail: gadelhak@vcu.edu  
World Wide Web Home Page: <http://www.people.vcu.edu/~gadelhak/>

### Vital Statistics

Male  
Married: two children  
Social Security Number: xxx-xx-xxxx  
United States Citizen  
Excellent Health

### Security Clearance

Secret

### Present Status

The Inez Caudill Eminent Professor of Biomedical Engineering and Professor of Mechanical & Nuclear Engineering, Virginia Commonwealth University, Richmond, Virginia.

### Education

- Completed the Leadership Development Program, Grace E. Harris Leadership Institute, Virginia Commonwealth University, Richmond, Virginia, 2004.
- Ph.D. (Fluid Mechanics), the Johns Hopkins University, Baltimore, Maryland, 1973. (Thesis Advisor: Professor Stanley Corrsin.)
- B.Sc. (Mechanical Engineering), Ain Shams University, Cairo, Egypt, 1966.

### Employment

- The Inez Caudill Eminent Professor of Biomedical Engineering and Professor of Mechanical & Nuclear Engineering, Virginia Commonwealth University, Richmond, Virginia, 2009–present.

- The Inez Caudill Eminent Professor of Biomedical Engineering and Chair of Mechanical Engineering, Virginia Commonwealth University, Richmond, Virginia, 2002–2009.
- Alexander von Humboldt Professor of Fluid Mechanics, Institut für Luft- und Raumfahrt, Technische Universität Berlin, Germany, 2003.
- Alexander von Humboldt Professor of Fluid Mechanics, Institut für Luft- und Raumfahrt, Technische Universität München, Germany, 2002.
- Alexander von Humboldt Professor of Fluid Mechanics, Technische Fakultät, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany, 2000–2001.
- Gastwissenschaftler (Guest Scientist) at Forschungszentrum Rossendorf, Dresden, Germany, May–August 1997.
- Professeur Exceptionnel, Faculté des Sciences, Université de Poitiers, Poitiers, France, May–August 1994.
- Distinguished Faculty Fellow, Naval Undersea Warfare Center, Newport, Rhode Island, May 1993–August 1993.
- Adjunct Professor, School of Architecture, University of Notre Dame, Notre Dame, Indiana, August 1992–May 1996.
- Professeur Invité (Visiting Professor), Institut de Mécanique de Grenoble, France, September 1991–July 1992.
- Professor of Aerospace and Mechanical Engineering, University of Notre Dame, Notre Dame, Indiana, September 1986–2002.
- Program Manager, Flow Research Company, Kent, Washington, September 1985–August 1986.
- Senior Research Scientist, Flow Research Company, June 1978–August 1985.
- Research Scientist, Flow Research Company, September 1976–May 1978.
- Visiting Assistant Professor, Department of Engineering Science and Systems, University of Virginia, Charlottesville, Virginia, September 1974–August 1976.
- Post-Doctoral Research Associate, Department of Aerospace Engineering; and Senior Lecturer, Department of Civil Engineering, University of Southern California, September 1973–August 1974.
- Post-Doctoral Research Associate, Departments of Mechanics & Materials Science and Geography & Environmental Engineering, the Johns Hopkins University, January 1973–August 1973.
- Teaching Assistant, Department of Mechanics and Materials Science, the Johns Hopkins University, September 1972–June 1973.
- Research Assistant, Department of Mechanics, the Johns Hopkins University, September 1969–December 1972.
- Instructor, Mechanical Engineering Department, Ain Shams University, September 1966–June 1968.

## Editorship

- Associate Technical Editor, *AIAA Journal*, 1988–1991.
- Associate Editor, *Applied Mechanics Reviews*, 1988–2010.
- Contributing Editor, Springer-Verlag's *Lecture Notes in Engineering*, 1988–present.

- Contributing Editor, McGraw-Hill's *Yearbook of Science and Technology*, 1992–present.
- Contributing Editor, Springer-Verlag's *Lecture Notes in Physics*, 1996–present.
- Contributing Editor, CRC Press' *Mechanical Engineering Series*, 1999–present.
- Associate Editor, *eFluids.com*, 2002–present.
- Member of the International Editorial Advisory Board, *Bulletin of the Polish Academy of Sciences—Technical Sciences*, 2004–present.
- Editor-in-Chief, *eMicroNano.com*, 2004–present.
- Contributing Editor, McGraw-Hill's *Encyclopedia of Science and Technology*, 2005–present.
- Editorial Advisory Board, *International Journal of Flow Control*, 2008–present.
- Editorial Board, *CFD Letters*, 2009–present.
- Editorial Board, *International Journal of Aerospace Engineering*, 2010–present.

## Consultant

- Flow Industries, Inc., September 1986–August 1988.
- Allen Engineering, January 1989–May 1989.
- Cortana Corporation, May 1989–present.
- Naval Under Water Systems Center, August 1989–September 1989.
- National-Standard Corporation, January 1990–December 1990.
- Whirlpool Corporation, May 1990–August 1990.
- SPECTREX, Inc., December 1990–present.
- United States Department of Defense, May 1991–October 1991.
- United Nations, June 1991–December 1991.
- Egyptian Academy of Scientific Research and Technology, June 1991–December 1991.
- Arab Organization for Industrialization, June 1991–December 1991.
- Arab Institute for Aviation Technology, June 1991–December 1991.
- Ministère de la Recherche et de la Technologie, France, August 1991–present.
- CFD Research Corporation, August 1992–present.
- Weldun International, Inc., August 1994–present.
- Type A Consultant to the U.S. Chief of Naval Research, June 1998–present.
- International Equipment Company, April 1999–present.
- Tredegar Corporation, March 2013–present.
- Crowgey, Hezel & Cassis, PLLC, 2013–present.

## Committee Assignment

- Member of Students Housing Committee, University of Virginia, 1974–76.
- National Science Foundation Panelist—Small Business Research Innovation Program, 1987.
- Member of Faculty Senate, University of Notre Dame, 1987–1990. Member of Executive Committee, 1988–1990.
- Member of Benefits Committee, University of Notre Dame, 1987–1990. Chairman of Benefits Committee, 1988–1990.
- Member of Graduate Studies Committee, Department of Aerospace and Mechanical Engineering, University of Notre Dame, 1987–1989.
- Member of Committee on University Governance, University of Notre Dame, 1989–1991. Chairman of Committee on University Governance, 1989–1990. Member of Steering Committee, 1990–1991.
- Member of Engineering College Council, University of Notre Dame, 1989–1991, 1999–2001.
- Member of AIAA’s Technical Committee on Fluid Dynamics, 1989–1991.
- Member of the Theoretical and Applied Mechanics Committee, Center for Applied Mathematics, 1996–2002.
- Member of University Committee on Patents, University of Notre Dame, 1996–2000.
- Member of Program Committee, Division of Fluid Dynamics, the American Physical Society, 1998–1999.
- Member of the College of Engineering Graduate Programs Committee, Virginia Commonwealth University, 2002–2010.
- Member of the College of Engineering Undergraduate Curriculum Committee, Virginia Commonwealth University, 2002–2010.
- Member of the University Council, Virginia Commonwealth University, 2002–present.
- Chair of the External Affairs Committee of the Division of Fluid Dynamics of the American Physical Society, 2002–2005.
- Member of the Committee on Faculty Affairs of the University Council, Virginia Commonwealth University, 2003–present.
- Chair of the Peer Committee to review the Chair of Biomedical Engineering, College of Engineering, Virginia Commonwealth University, 2003.
- Chair of the Peer Committee to review the Chair of Chemical Engineering, College of Engineering, Virginia Commonwealth University, 2003.
- Member of the College of Engineering Academic Quality Task Force, Virginia Commonwealth University, 2003–2010.
- Member of the Advisory Board for Virginia Modeling, Analysis and Simulation Center, Suffolk, Virginia, 2003–present.
- Serve on the External Advisory Board for the Ann & H. J. Smead Department of Aerospace Engineering Sciences, University of Colorado at Boulder, 2018–present.



## Patents

- Method and Apparatus for Controlling Bound Vortices in the Vicinity of Lifting Surfaces (United States Patent Number 4,697,769; 10/6/1987).
- Method and Apparatus for Reducing Turbulent Skin Friction (United States Patent Number 4,932,612; 6/12/1990).
- Method and Apparatus for Controlling Turbulent Boundary Layers. Disclosed 12 June 1992.
- Method and Apparatus for Pumping Fluids in Extremely Small Spaces. Disclosed 9 February 1995.
- Method and Apparatus for Constructing a Shadowgraph Using TeraHertz Waves. Disclosed 13 February 2003.
- Method and Apparatus for Constructing a Schlieren Image Using TeraHertz Waves. Disclosed 13 February 2003.
- Method and Apparatus for Enhancing the Lift of Flapping Wings. Disclosed 1 March 2005.
- Method and Apparatus for Using Superhydrophobic Fibers for Drag and Noise Reduction for Ships, Submarines and Liquid Conduits. Disclosed 10 February 2009.
- Method and Apparatus for Thermo-Regulated Gloves and Socks. Disclosed 3 May 2016. Provisional Serial Number 62/337,456.

## Academic Honors & Professional Recognition

- Presidential award for excellence in engineering education from Ain Shams University; academic years 1963–64, 1964–65, and 1965–66.
- Summa cum laude from Ain Shams University; 1966.
- Whitehead Fellowship from the Johns Hopkins University; academic years 1968–69, 1969–70, 1970–71, 1971–72, and 1972–73.
- Member of the National Science Foundation Advisory Panel for the Small Business Innovation Research Program, 1987; 1995.
- Associate Fellow of the American Institute of Aeronautics and Astronautics, 1988.
- AIAA Survey Paper Citation, 1989.
- AIAA Dedicated Service Citation, 1991.
- TOKTEN Program Fellowship, United Nations Development Programme, 1991.
- Bourse de Haut Niveau, Ministère de la Recherche et de la Technologie, France, 1991.
- Professeur Invité, Institut National Polytechnique de Grenoble, France, 1991.
- Senior Guest, Bourses de Recherche Scientifique et Technique de l'OTAN, North Atlantic Treaty Organization, France, 1991.
- AIAA Certificate for Distinguished Leadership and Service, 1992.
- United States Navy's Distinguished Faculty Fellow, 1993.
- Office of Naval Research/American Society for Engineering Education Certificate of Recognition Award for Research Contributions, 1994.

- AIAA Survey Paper Citation, 1994.
- Professeur Exceptionnel, Faculté des Sciences, Université de Poitiers, France, 1994.
- Fellow of the American Society of Mechanical Engineers, 1995.
- Member of the Advisory Board, NASA/DOE Aerospace/Energy Research and Education Program, Southern University, Baton, Rouge, Louisiana, 1995.
- Honorary Member of Pi Tau Sigma (the National Honorary Mechanical Engineering Fraternity), and Sigma Beta (the University of Notre Dame Chapter of PTS), 1996.
- Member-at-Large of Sigma Xi (the Scientific Research Society), 1996.
- Gastwissenschaftler (Guest Scientist), Forschungszentrum Rossendorf, Dresden, Germany, 1997.
- Guest of the Swedish Research Council, Chalmers Tekniska Högskola, Göteborg, Sweden, 1997.
- Inducted as eminent engineer in Tau Beta Pi (the National Engineering Honor Society), and Gamma (the Indiana Chapter of TBP), 1997.
- Honorary Member of Sigma Gamma Tau (the National Honor Society in Aerospace Engineering), 1997.
- Designated the Fourteenth ASME Freeman Scholar (highest honor of the Division of Fluids Engineering; awarded biennially), 1998.
- The Japanese Government Research Award for a Foreign Scholar, 1999.
- The Korean Government Research Award for a Foreign Scholar, 1999.
- Alexander von Humboldt Prize—Germany’s highest research award for worldwide scientists and scholars in all disciplines, 1999.
- Fellow and Life Member of the American Physical Society, “for his original contributions to reactive control of turbulent flows, pioneering work in developing laser-induced fluorescence techniques, and definitive experiments detailing fluid-compliant surface interactions,” 2000.
- Fellow of the American Institute of Physics, 2000.
- Fellow of the American Academy of Mechanics (La Academia Americana de Mecánica), 2001.
- Named ASME Distinguished Lecturer, 2002.
- Inducted into the Johns Hopkins University Society of Scholars, 2002.
- Designated as the Inez Caudill Eminent Professor of Biomedical Engineering, Virginia Commonwealth University, 2002.
- Elected as a member of the Advisory Board for Virginia Modeling, Analysis and Simulation Center, Suffolk, Virginia, 2003.
- Member of the International Scientific Committee, Institute of Sustainable Surface Transport, Université de Valenciennes, Valenciennes, France, 2010.
- An article he co-authored (“We Must Stop the Avalanche of Low-Quality Research,” *The Chronicle of Higher Education*, 10 June 2010) was chosen by the British Science Council to be part of a standardized English examination, 2011.
- Fellow of the American Association for the Advancement of Science, 2012.

- Founding member of the American Physical Society’s Topical Group on Soft Matter, 2014. Soft Matter is a highly interdisciplinary field involving scientists, mathematicians, and engineers. It is one of the fastest growing areas of research today.
- Invited by the United Nations to participate in the International Year of Light and Light-Based Technologies (IYL 2015). Delivered lectures in Algeria and Egypt as part of that worldwide celebration, which marks the 100<sup>th</sup> anniversary of Albert Einstein’s General Theory of Relativity, and the 1000<sup>th</sup> anniversary of Ibn al-Haytham’s seven-volume Book of Optics.
- ASME Medal for “significant seminal contributions to the discipline of fluids engineering”, 2016.
- ASME Certificate of Appreciation “in testimony of the high regard of your associates and the deep appreciation of the society for your valued services in advancing the engineering profession”, 2016.
- To honor Professor Gad-el-Hak, six academicians from three countries penned the editorial “Homage to a Legendary Dynamicist on His Seventy-Fifth Birthday”. The article appeared in the July 2020 issue of the *Journal of Fluids Engineering*. <https://www.people.vcu.edu/~gadelhak/Homage.pdf>
- Gad-el-Hak’s invited review paper, “Slippery Surfaces: a Decade of Progress,” *Physics of Fluids* **33**, pp. 071301.1–071301.35, was selected as the Editor’s Pick, 2021.
- Research work cited in articles that appeared in the following popular magazines: Across the Spectrum; Air & Space Smithsonian; Discover; El-Shabab; Engineering & Technology; Engineering News; Federal Way News; Mechanical Engineering; NanoNews; Newsweek; Notre Dame Magazine; Richmond Times Dispatch; Science; Science News; The Economist; The Free Lance-Star; and Youth ’86.
- Listed in Marquis Who’s Who in the World; Marquis Who’s Who in America; Marquis Who’s Who in Science and Engineering; Marquis Who’s Who in American Education; Marquis Who’s Who in the Midwest; Marquis Who’s Who in the South and Southwest; Who’s Who Among America’s Teachers, Lexington Who’s Who; Dictionary of International Biography; American Men and Women of Science; Who’s Who in Technology; Who’s Who of American Inventors; Who’s Who in Engineering Education; Empire Who’s Who; and several others. Listed by the International Biographical Centre as one of 2000 Outstanding Scientists of the 20th Century as well as one of 2000 Outstanding Intellectuals of the 21st Century.

## Keynote Addresses

- “Splendeur des Fluides en Mouvement,” keynote address, *Cinquième Colloque National de Visualization et de Traitement d’Images en Mécanique des Fluides*, Université de Poitiers, Poitiers, France, 2–5 June 1992.
- “What Does It Take to Tame Turbulence?,” keynote address, *International Workshop on Electromagnetic Boundary Layer Control (EBLC) for Saltwater Flows*, Dresden, Germany, 7–8 July 1997.
- Chosen as the 2000 speaker for the *Southwest Mechanics Lecture Series*, involving nine universities in the United States Southwest region.
- “Compliant Coatings: What Works and What Doesn’t?,” keynote address, *IUTAM Symposium on Flow in Collapsible Tubes and Past Other Highly Compliant Boundaries*, Warwick University, Coventry, England, 26–30 March 2001.
- Invited Speaker in the *von Kármán Institute Lecture Series*, 15–19 April 2002, Brussels, Belgium.
- “Micropumps, Microturbines, and Flow Physics in MEMS,” keynote address, *Smart Electronics, MEMS, BioMEMS, and Nanotechnology Conference*, San Diego, California, 3–5 March 2003.

- “Momentum and Heat Transfer in MEMS,” keynote address, *Thermique et Microtechnologies Conférence de la Société Française de Thermique*, Grenoble, France, 3–6 June 2003.
- “Flow Physics in Microdevices,” keynote address, *The Fluid Mechanics Colloquium*, Universität Karlsruhe, Karlsruhe, Germany, 14 July 2003.
- “Turbulence: The Taming of the Shrew,” and “Flow Physics in Microdevices,” keynote addresses, *Symposium in Honor of Professor Carlo Ferrari (1903–1996)*, Politecnico di Torino, Turin, Italy, 8 October 2003.
- “Liquids: The Holy Grail of Microfluidics Modeling,” keynote address, *Focus on Interface Driven Flows at the Micro- and Nanoscales, American Physical Society Annual March Meeting*, Montreal, Quebec, Canada, 22–26 March 2004.
- “Liquids: The Holy Grail of Microfluidics Modeling,” keynote address, *International Conference on MEMS, NANO, and Smart Systems*, Banff, Alberta, Canada, 25–27 August 2004.
- “Structure of Turbulent Boundary Layers with Zero Pressure Gradient,” keynote address, *Fourth AIAA Theoretical Fluid Mechanics Conference*, Toronto, Ontario, Canada, 6–9 June 2005.
- “The Mean Velocity Profile of Turbulent Boundary Layers Approaching Separation,” keynote address, *Fourth AIAA Theoretical Fluid Mechanics Conference*, Toronto, Ontario, Canada, 6–9 June 2005.
- “Differences Between Liquid and Gas Flows at the Microscale,” keynote address, *Third International Conference on Microchannels and Minichannels*, Toronto, Ontario, Canada, 13–15 June 2005.
- “The Art and Science of Large-Scale Disasters,” plenary lecture, *U.S.–Egypt Workshop on Predictive Methodologies for Global Weather, Climate Change and Related Disasters*, Cairo, Egypt, 13–15 March 2006.
- “The Art and Science of Large-Scale Disasters,” distinguished lecture, *Baltimore Section of the American Institute of Aeronautics & Astronautics*, Laurel, Maryland, 20 April 2006.
- “Turbulent Boundary Layers: Reality and Myth,” keynote address, *Minisymposium on Asymptotic Methods for Laminar and Turbulent Boundary Layers, International Conference on Boundary and Interior Layers—Computational & Asymptotic Methods (BAIL 2006)*, Göttingen, Germany, 24–28 July 2006.
- “The Taming of the Shrew: Why Is It So Difficult to Control Turbulence?,” plenary lecture, *International Conference on Active Flow Control*, Berlin, Germany, 27–29 September 2006.
- “The Taming of the Shrew: Why Is It So Difficult to Control Turbulence?,” plenary lecture, *First International Conference on Fluid Dynamics and Materials Processing*, Algiers, Algeria, 2–5 June 2007.
- “Flow Modeling for Micro- and Nanodevices,” invited talk, *Modeling and Computational Methods in Fluid Dynamics and Material Science: Towards the Challenge of the Nanoscales*, Bressanone, Italy, 19–22 December 2007.
- “The Art and Science of Large-Scale Disasters,” keynote address, *Scientific Memorial Meeting for Peter W. Carpenter*, University of Warwick, Coventry, United Kingdom, 22 September 2008.
- “Five Centuries of Turbulence Research: from da Vinci, to Kolmogorov, to the Universal Log Law,” invited talk, *International Symposium on Turbulence*, Beijing, China, 21–25 September 2009.
- “Five Centuries of Turbulence Research: from da Vinci, to Kolmogorov, to the Universal Log Law,” invited talk, *Sixth Annual Burgers Symposium*, College Park, Maryland, 18 November 2009.
- “Control of Turbulence: the Role of Flow Visualization,” keynote address, *International Workshop on Recent Trends in Flow Visualization*, Roorkee, India, 29–31 December 2009.

- “Five Centuries of Turbulence Research: from da Vinci, to Kolmogorov, to the Universal Log Law,” keynote address, *International Workshop on Recent Trends in Flow Visualization*, Roorkee, India, 29–31 December 2009.
- “The Taming of the Shrew: Why Is It So Difficult to Control Turbulence?,” plenary lecture, *VII Escola de Primavera de Transição e Turbulência*, Ilha Solteira, Brazil, 27 September–1 October 2010.
- “Five Centuries of Turbulence Research: from da Vinci, to Kolmogorov, to the Universal Log Law,” plenary lecture, *VII Escola de Primavera de Transição e Turbulência*, Ilha Solteira, Brazil, 27 September–1 October 2010.
- “Scales of Turbulence: from the Human, to the Geologic, to the Cosmologic,” invited talk, *The 2011 World Congress on Mathematical Modeling and Computational Simulation of Cardiovascular and Cardiopulmonary Dynamics*, Williamsburg, Virginia, 31 May–3 June 2011.
- “Five Centuries of Turbulence,” invited lecture, *Symposium on Frontiers of Fluid Dynamics—A Legacy*, San Juan, Puerto Rico, 1–3 November 2013.
- “Five Centuries of Turbulence: from da Vinci, to Kolmogorov, to the Universal Log Law,” the Don-Kay-Clay Cash Distinguished Lecturer, Texas Tech University, Lubbock, Texas, 25 April 2014.
- “English, STEM, and Salmon Fishing in the Yemen,” Berglund Seminar Series, Honors College, Virginia Commonwealth University, Richmond, Virginia, 30 January 2015 and 2 September 2015.
- “Five Centuries of Turbulence: from da Vinci, to Kolmogorov, to the Universal Log Law,” invited lecture, UNESCO International Year of Light and Light-Based Technologies, Algiers, Algeria, 16 December 2015.
- “English, STEM, and Salmon Fishing in the Yemen,” invited lecture, UNESCO International Year of Light and Light-Based Technologies, Algiers, Algeria, 17 December 2015.
- “Nine Decades of Fluid Mechanics,” plenary lecture, *ASME Fluids Engineering Division Summer Meeting*, Washington, DC, 10–14 July 2016.
- “Five Centuries of Turbulence: from da Vinci, to Kolmogorov, to the Universal Log Law,” plenary lecture, *XXIV Fluid Mechanics Conference*, Rzeszów, Poland, 1–3 July 2020.

## Meetings Organized

- Session Chairman, several American Physical Society Meetings.
- Session Chairman, several AIAA Meetings.
- Session Chairman, several ASME Meetings.
- Session Chairman; several IUTAM Meetings.
- Session Organizer and Chairman, *First U.S. National Congress of Fluid Dynamics*, 1988.
- Member of the Organizing Committee, *AIAA Shear Flow Control Conference*, Orlando, Florida, 7–9 July 1993.
- Organizer of a short course, *Flow Control: Fundamentals and Practices*, Corsica, France, 24–28 June 1996.
- Organizer, *Workshop on Flow Control*, Corsica, France, 1–5 July 1996.
- Organizer of a short course, *Flow Control: Fundamentals and Practices*, Notre Dame, Indiana, 9–13 September 1996.
- Organizer, *Symposium on Application of Microfabrication to Fluid Mechanics*, ASME Winter Annual Meeting, Atlanta, Georgia, 17–22 November 1996.

- Member of the Executive Council and the International Scientific Committee, *International Congress on Fluid Dynamics and Propulsion*, Cairo, Egypt, 29–31 December 1996.
- Member of the Conference Committee, *Fourth World Conference in Applied Fluid Dynamics*, Freiburg, Germany, 7–11 June 1998.
- Chair, *Fifty-Second Annual Meeting of the Division of Fluid Dynamics of the American Physical Society*, New Orleans, Louisiana, 21–23 November 1999.
- Member of the Organizing Committee, *Twentieth International Congress of Theoretical and Applied Mechanics (ICTAM 2000)*, Chicago, Illinois, 27 August–1 September 2000.
- Member of the Organizing Committee, *IUTAM Symposium on Flow in Collapsible Tubes and Past Other Highly Compliant Boundaries*, Coventry, England, 26–30 March 2001. Delivered the keynote address at the same meeting.
- Member of the International Scientific Committee, *Seventh International Congress on Fluid Dynamics and Propulsion*, Cairo, Egypt, 19–21 December 2001.
- Member of the Organizing Committee, *AIAA Third Theoretical Fluid Dynamics Conference*, Saint Louis, Missouri, 24–27 June 2002.
- Member of the Organizing Committee, *ASME Fifth International Symposium on Fluid–Structure Interactions, Aeroelasticity, and Flow-Induced Vibrations and Noise*, New Orleans, Louisiana, 17–22 November 2002.
- Chair, *Minisymposium on Advances in Flow Control*, Fifty-Fifth Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Dallas, Texas, 24–26 November 2002.
- Member of the Executive Council and the International Scientific Committee, *Eighth International Congress on Fluid Dynamics and Propulsion*, Sharm el-Sheikh, Egypt, 15–18 December 2003.
- Organizer, *Focus Topic: Interface Driven Flows at the Micro- and Nanoscales*, American Physical Society Annual March Meeting, Montreal, Quebec, Canada, 22–26 March 2004.
- Member of the Scientific Committee, *First International Conference on Advances in Mechanics and Mechatronics*, Udine, Italy, 25–27 March 2004.
- Co-Chair of a special program, *Wall-Bounded and Free-Surface Turbulence and Its Computations*, Institute for Mathematical Sciences, National University of Singapore, Singapore, July–December 2004.
- Organizer, *Flow Control Pre-Nominated Sessions*, Twenty-First International Congress of Theoretical and Applied Mechanics, Warsaw, Poland, 15–21 August 2004.
- Co-Chair, *International Conference on MEMS, NANO, and Smart Systems (ICMENS 2004)*, Banff, Alberta, Canada, 25–27 August 2004.
- Chair, *Transport Phenomena in Micro and Nanodevices*, Engineering Conference International, Kona Coast, Island of Hawaii, 17–21 October 2004.
- Co-Chair, *Workshop on Transition and Turbulence Control*, Institute for Mathematical Sciences, National University of Singapore, Singapore, 8–10 December 2004.
- Member of the Scientific Committee, *International Conference on Embedded and Hybrid Systems*, Singapore, 12–15 April 2005.
- Member of the Executive Committee, *Fourth Biennial Turbulence and Shear Flow Phenomena Meeting (TSFP-4)*, Williamsburg, Virginia, 27–29 July 2005.

- Co-Chair, *International Conference on MEMS, NANO, and Smart Systems (ICMENS 2005)*, Banff, Alberta, Canada, 24–27 July 2005.
- Member of the Organizing Committee, *Third ASME/WSEAS International Conference on Heat Transfer, Thermal Engineering and Environment*, Corfu Island, Greece, 20–22 August 2005.
- Chair of the Organizing Committee, *U.S.–Egypt Workshop on Predictive Methodologies for Global Weather Related Disasters*, Cairo, Egypt, 13–15 March 2006.
- Chair, *Second International Conference on Transport Phenomena in Micro and Nanodevices*, Engineering Conference International, Barga, Italy, 11–15 June 2006.
- Member of the International Program Committee, *International Conference on Active Flow Control*, Technische Universität Berlin, Germany, 27–29 September 2006.
- Co-Chair, *International Conference on MEMS, NANO, and Smart Systems (ICMENS 2006)*, Cairo, Egypt, 27–29 December 2006.
- Member of the Scientific Committee, *First International Conference on Fluid Dynamics and Materials Processing*, Algiers, Algeria, 2–5 June 2007.
- Member of the International Advisory Board, *Second International Conference on MEMS and Nanotechnology*, Kuala Lumpur, Malaysia, 13–15 May 2008.
- Member of the Scientific Committee, *Second International Conference on Sciences of Mechanics*, Constantine, Algeria, 16–18 November 2008.
- Member of the Advisory Committee, *International Workshop on Recent Trends in Flow Visualization*, Roorkee, India, 29–31 December 2009.
- Organized the session “The Laws of Nature Applied to Cardiovascular and Cardiopulmonary Flows,” *The 2011 World Congress on Mathematical Modeling and Computational Simulation of Cardiovascular and Cardiopulmonary Dynamics*, Williamsburg, Virginia, 31 May–3 June 2011.
- Member of the Scientific Committee, *Eighth Seminar of Mechanics*, Ministry of National Defense, Algiers, Algeria, 10–11 April 2012.
- Member of the Scientific Committee, *Contemporary Problems of Mathematics, Mechanics and Computing Sciences*, School of Mechanics and Mathematics, V. N. Karazin Kharkov National University, Kharkov, Ukraine, 17–22 April 2012.
- Member of the International Program Committee, *Active Flow & Combustion Control 2018*, Berlin, Germany, 19–21 September 2018.

## Areas of Competence

- Turbulence.
- Stability and Transition.
- Geophysical Fluid Dynamics.
- Thermal Systems.
- Unsteady Aerodynamics.
- Experimental Fluid Mechanics.
- Fluid-Structure Interactions, including Compliant Coatings.

- Flow Control.
- Micromechanics, Microfluids, and Microelectromechanical Systems (MEMS).
- Navier–Stokes Simulations, Soft Computing, and Genetic Algorithms.

## Professional Societies

- American Academy of Mechanics (Fellow).
- American Association for the Advancement of Science (Fellow).
- American Institute of Aeronautics and Astronautics (Associate Fellow).
- American Institute of Physics (Fellow).
- American Physical Society (Fellow and Life Member).
- American Society of Mechanical Engineers (Fellow).
- European Mechanics Society.

## Honorary Societies

- Gamma.
- Pi Tau Sigma (Honorary Member).
- Sigma Beta.
- Sigma Gamma Tau (Honorary Member).
- Sigma Xi (Member-at-Large).
- Tau Beta Pi (Eminent Engineer).

## Reviewer

- Acta Mechanica.
- AIAA Journal.
- American University of Sharjah.
- Applied Mechanics Reviews.
- Arab Science and Technology Foundation.
- Army Research Office.
- Bulletin of the Polish Academy of Sciences.
- Cambridge University Press.
- Canadian Journal of Physics.
- Communications in Numerical Methods in Engineering.
- Comptes Rendus de l'Académie des Sciences: Mécanique.



- CRC Press.
- Department of Energy.
- Department of Defense.
- Deutsche Forschungsgemeinschaft (DFG).
- Experiments in Fluids.
- Flow, Turbulence and Combustion Journal.
- Fonds de la Recherche Scientifique (Belgium).
- International Journal of Aerospace Engineering.
- International Journal of Experimental Heat Transfer, Thermodynamics, and Fluid Mechanics.
- International Journal of Heat and Fluid Flow.
- International Journal of Heat and Technology.
- Journal of Aircraft.
- Journal of Applied Mechanics.
- Journal of Computational Physics.
- Journal of Fluid Mechanics.
- Journal of Fluids and Structures.
- Journal of Fluids Engineering.
- Journal of Propulsion and Power.
- Journal of Vibration, Acoustics, Stress and Reliability in Design.
- Langmuir.
- McGraw-Hill.
- Meccanica.
- Microfluidics and Nanofluidics.
- Natural Sciences & Engineering Research Council of Canada.
- NASA.
- National Science Foundation.
- National Science Foundation of the Czech Republic.
- Natural Sciences and Engineering Research Council of Canada.
- Nature.
- Ocean Engineering.
- Physica D: Nonlinear Phenomena.
- Physics of Fluids.
- Proceedings of the Royal Society of London.
- Qatar National Research Fund, Qatar Foundation, Doha, Qatar.
- Review of Scientific Instruments.
- SIAM Review.

## Graduate Courses Taught

- Advanced Fluid Mechanics.
- Effective Technical Writing.
- Flow Control.
- Hydrodynamic Stability.
- Intermediate Fluid Mechanics.
- Intermediate Heat Transfer.
- Turbulence.
- Viscous Flows.

## Undergraduate Courses Taught

- Aerodynamics Laboratory.
- Building Systems.
- Engineering Design.
- Environmental Control Systems.
- Environmental Synthesis.
- Fluid Mechanics.
- Fluid Mechanics Laboratory.
- Gas Turbines.
- Heat Transfer.
- Hydraulics.
- Ideal Aerodynamics.
- Independent Research for Undergraduates.
- Instrumentation.
- Internal Combustion Engines.
- Mechanics.
- Power Plants.
- Production Engineering.
- Refrigeration and Air Conditioning.
- Senior Design Project (ME major).
- Thermodynamics.

## Short Courses Taught

- Fundamentals of Mechanics (Baltimore, Maryland, January 1972).
- Animal Mechanics (Baltimore, Maryland, January 1973).
- What Does the Industrial Engineer Need to Know about Fluid Dynamics? (Chicago, Illinois, September 1989).
- Flow Instabilities Encountered During Processing of Industrial Liquids (Chicago, Illinois, September, 1989).
- What Does the Aviation Engineer Need to Know about Fluid Dynamics? (Cairo, Egypt, June 1991).
- Turbulence (Notre Dame, Indiana, March 1996).
- Viscous Flows (Notre Dame, Indiana, March 1997).
- Flow Control: Fundamentals and Practices (Corsica, France, June 2000; and Notre Dame, Indiana, September 2000).
- Flow Control (Notre Dame, Indiana, March 2001).
- AIAA's Flow Control: Fundamentals and Practices (St. Louis, Missouri, June 2001).
- Von Kármán Institute Lecture Series on MEMS and Active Flow Control (Brussels, Belgium, April 2002; and Cleveland, Ohio, March 2003).
- AIAA's Fundamentals and Applications of Microfluidics (Reno, Nevada, January 2004).
- CISM's Flow and Transport in Microchannels (Udine, Italy, October 2005).
- NIH's Computational Modeling and Simulation of Cardiovascular and Cardiopulmonary Dynamics (Richmond, Virginia, February 2008).
- Tutorial School on Fluid Dynamics: Topics in Turbulence (College Park, Maryland, May 2010).
- VII Escola de Primavera de Transição e Turbulência (Ilha Solteira, Brazil, September 2010).
- Effective Technical Writing (Lubbock, Texas, July 2014).
- Effective Technical Writing (Cottbus, Germany, April 2016).

## Graduate Theses & Postdoctoral Fellows Directed

- Martin T. Kokus, "A Physical Model of the Earth's Atmospheric Surface Layer," M.Sc. Degree, May 1975
- Deborah B. Pierce, "The Interaction of Unidirectional Winds with an Isolated Barchan Sand Dune," M.Sc. Degree, May 1976.
- Suyog Bhobe, "Control of Vortex Breakdown on Delta Wings," M.Sc. Degree, January 1987.
- Chiqiong Xu, "Analysis of Flow over Fixed and Rotatable Cylinder-Splitter Plate Body," M.Sc. Degree, August 1990.
- Tarek G. Zaki, "Experimental and Numerical Investigation of Flow Past a Freely Rotatable Square Cylinder," M.Sc. Degree, August 1991.
- Dr. Alain Texier, Visiting Scholar from Université de Poitiers, France, 1995.
- Dr. M. C. Sharatchandra, Postdoctoral Fellow, August 1995–July 1996.

- Gaël Denis, “Interfacial and Molecular Physics in a Liquid Micropump,” End-of-Study Thesis, August 1996.
- David DeCourtye, “Three-Dimensional Effects in a Novel Micropump,” End-of-Study Thesis, August 1996.
- Jérôme Maureau, “Slip-Effects in a Journal Bearing,” End-of-Study Thesis, August 1996.
- Dr. Lennart Löfdahl, Visiting Melchor Chair Professor from Chalmers University of Technology, 1998.
- Dr. Jinliang Xu, Postdoctoral Fellow, September 2001–August 2002.
- Ravi Bhadauria, End-of-Study Thesis, May–August 2006.
- Amneet p. S. Bhalla, End-of-Study Thesis, May–August 2007.
- Piyush Agarwal, End-of-Study Thesis, May–August 2007.
- Dr. Justyna Czerwinska, Visiting Scholar, June–August 2007; July–August 2008.
- Ravi Bhadauria, M.Sc. Degree, August 2007–December 2009.
- Mohamed A. Samaha, Ph.D. Degree, August 2009–May 2012.
- Dr. Fredrick Ochanda, Postdoctoral Fellow, September 2010–August 2011.
- Dr. Babak Emami, Postdoctoral Fellow, November 2010–October 2011.
- Luis C. González Sua, Ph.D. Degree, June 2011–May 2013.
- Nazanin Rezaee Ghavamabadi, Ph.D. Degree, August 2012–May 2015.
- Rawan A. Al Nsour, Ph.D. Degree, August 2010–May 2014.
- Edwin Gaddis, Ph.D. Degree, August 2013–May 2016.

## External Examiner & Promotion Jury

- American University of Beirut, Beirut, Lebanon.
- Arizona State University, Tempe, Arizona.
- Boston University, Boston, Massachusetts.
- Brown University, Providence, Rhode Island.
- Cairo University, Cairo, Egypt.
- California Institute of Technology, Pasadena, California.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania.
- Chalmers University of Technology, Göteborg, Sweden.
- Collège Militaire Royal du Canada, Kingston, Ontario, Canada.
- Concordia University, Montreal, Quebec, Canada.
- École Centrale de Lyon, Lyon, France.
- Florida State university, Tallahassee, Florida.
- George Washington University, Washington, DC.

- Illinois Institute of Technology, Chicago, Illinois.
- Indian Institute of Technology—Delhi, Delhi, India.
- Indian Institute of Technology—Kanpur, Kanpur, India.
- Indian Institute of Technology—Roorkee, Roorkee, India.
- Institut de Mécanique Statistique de la Turbulence, Marseille, France.
- Institut National Polytechnique, Grenoble, France.
- Louisiana State University, Baton Rouge, Louisiana.
- McGill University, Montreal, Canada.
- Nanyang Technological University, Singapore.
- National University of Singapore, Singapore.
- Oklahoma State University, Stillwater, Oklahoma.
- Old Dominion University, Norfolk, Virginia.
- Oregon State University, Corvallis, Oregon.
- Pennsylvania State University, College park, Pennsylvania.
- Polytechnic University, Brooklyn, New York.
- Qatar University, Doha, Qatar.
- Royal Institute of Technology, Stockholm, Sweden.
- Rutgers University, Piscataway, New Jersey.
- Sistema Tecnológico de Monterrey, Monterrey, Mexico.
- Southern University, Baton Rouge, Louisiana.
- State University of New York, Buffalo, New York.
- Texas A&M University, College Station, Texas.
- Texas A&M University Qatar, Doha, Qatar.
- Tuskegee University, Tuskegee, Alabama.
- Université d'Aix-Marseille II, Marseille, France.
- Université de Poitiers, Poitiers, France.
- Université des Sciences et de la Technologie Houari Boumedienne, Alger, Algeria.
- University of Alberta, Edmonton, Alberta, Canada.
- University of Central Florida, Orlando, Florida.
- University of Cincinnati, Cincinnati, Ohio.
- University of Colorado, Boulder, Colorado.
- University of Iowa, Iowa City, Iowa.
- University of Kuwait, Safat, Kuwait.

- University of Maryland, College Park, Maryland.
- University of Melbourne, Melbourne, Australia.
- University of Missouri, Rolla, Missouri.
- University of Ottawa, Ottawa, Ontario, Canada.
- University of Pittsburgh, Pittsburgh, Pennsylvania.
- University of South Florida, Tampa, Florida.
- University of Southampton, Southampton, England.
- University of Southern California, Los Angeles, California.
- University of Vermont, Burlington, Vermont.
- University of Washington, Seattle, Washington.
- Virginia Commonwealth University, Richmond, Virginia.
- Virginia Tech, Blacksburg, Virginia.
- Warwick University, Coventry, England.
- Yale University, New Haven, Connecticut.

## **Foreign Languages**

- Arabic.
- French.
- German.
- Persian.
- Urdu.

## **Hobbies**

- Bicycling.
- Computers.
- Music.
- Reading.
- Swimming.

## Summary of Publications

- Books: 20 books.
- Journal Articles: 141 journal articles.
- Essays in Magazines and Newspapers: 52 essays.
- Book Chapters: 63 publications.
- Proceedings Articles: 73 publications.
- Refereed Meeting Articles and Abstracts: 150 articles.
- Reports: 120 reports.
- Book Reviews: 28 reviews.
- Patents: 2 granted; 7 disclosed.
- Invited Lectures: 313 lectures.

## List of Publications

### I. Books

1. Gad-el-Hak, M. (editor) (1989) *Advances in Fluid Mechanics Measurements, Lecture Notes in Engineering*, vol. 45, 606 pages, Springer-Verlag, New York, New York.
2. Gad-el-Hak, M. (editor) (1989) *Frontiers in Experimental Fluid Mechanics, Lecture Notes in Engineering*, vol. 46, 532 pages, Springer-Verlag, New York, New York.
3. Bonnet, J.-P., Gad-el-Hak, M., and Pollard, A. (editors) (1996) *Proceedings of the Workshop on Flow Control: Fundamentals and Practices*, 200 pages, Institut d'Etudes Scientifiques des Cargèse, Corsica, France.
4. Breuer, K.S., Bandyopadhyay, P.R., and Gad-el-Hak, M. (editors) (1996) *Application of Microfabrication to Fluid Mechanics*, DSC-Volume 59, 468 pages, ASME, New York, New York.
5. Gad-el-Hak, M., Pollard, A., and Bonnet, J.-P. (editors) (1998) *Flow Control: Fundamentals and Practices, Lecture Notes in Physics*, vol. m53, 540 pages, Springer-Verlag, Berlin.
6. Gad-el-Hak, M. (guest editor) (1998) *Flow Control: Fundamentals and Practices*, special issue of *Experimental Thermal and Fluid Science (ETFS)*, vol. 16, no. 1&2, 172 pages, Elsevier, New York, New York.
7. Gad-el-Hak, M. (2000) *Flow Control: Passive, Active, and Reactive Flow Management*, 448 pages, Cambridge University Press, London, United Kingdom. Reprinted in paperback 2006.
8. Gad-el-Hak, M. (editor) (2002) *The MEMS Handbook*, 1368 pages, CRC Press, Boca Raton, Florida. Second edition 2006.
9. Gad-el-Hak, M. (editor) (2004) *Proceedings of the International Conference on Transport Phenomena in Micro- and Nanodevices*, CD Publication, Engineering Conference International, Brooklyn, New York.
10. Gad-el-Hak, M. (guest editor) (2005) *Special Topics: Transport Phenomena in Micro- and Nanodevices*, special issue of *Physics of Fluids*, vol. 17, no. 10, 139 pages, American Institute of Physics, New York, New York.

11. Gad-el-Hak, M. (editor) (2006) *MEMS: Introduction and Fundamentals*, 448 pages, CRC Taylor & Francis, Boca Raton, Florida.
12. Gad-el-Hak, M. (editor) (2006) *MEMS: Design and Fabrication*, 664 pages, CRC Taylor & Francis, Boca Raton, Florida.
13. Gad-el-Hak, M. (editor) (2006) *MEMS: Applications*, 568 pages, CRC Taylor & Francis, Boca Raton, Florida.
14. Gad-el-Hak, M., and Tsai, H.M. (editors) (2006) *Transition and Turbulence Control*, 444 pages, World Scientific, Singapore.
15. Gad-el-Hak, M. (editor) (2006) *Proceedings of the U.S.–Egypt Workshop on Predictive Methodologies for Global Weather-Related Disasters*, CD Publication, Virginia Commonwealth University, Richmond, Virginia.
16. Gad-el-Hak, M. (editor) (2006) *Proceedings of the Second International Conference on Transport Phenomena in Micro- and Nanodevices*, CD Publication, Engineering Conference International, Brooklyn, New York.
17. Gad-el-Hak, M. (guest editor) (2007) *Transport Phenomena in Micro- and Nanodevices*, special issue of *Nanoscale and Microscale Thermophysical Engineering*, vol. 11, no. 1–2, 226 pages, Taylor & Francis, New York, New York.
18. Gad-el-Hak, M. (editor) (2008) *Large-Scale Disasters: Prediction, Control, and Mitigation*, 600 pages, Cambridge University Press, London, United Kingdom.
19. Kizilova, N., and Gad-el-Hak, M. (editors) (2012) *Contemporary Problems of Mathematics, Mechanics and Computing Sciences*, Kharkov University Press, Kharkov, Ukraine.
20. Castillo, L., Carbajal, G., and Gad-el-Hak, M. (editors) (2015) *TTU & WindInspire Summer Research Institute Proceedings: Renewable Energy & medicine*, Tex Tech University, Lubbock, Texas.

## II. Journal Articles

1. Gad-el-Hak, M., and Corrsin, S. (1974) “Measurements of the Nearly Isotropic Turbulence Behind a Uniform Jet Grid,” *Journal of Fluid Mechanics* **62**, pp. 115–143.
2. Kutchai, H., Morton, J.B., and Gad-el-Hak, M. (1977) “Turbulent-Flow Properties of Dilute Solutions of Red Blood-Cells,” *Biophysical Journal* **17**, p. A260.
3. Gad-el-Hak, M., Morton, J.B., and Kutchai, H. (1977) “Turbulent-Flow of Red-Cells in Dilute Suspensions: Effect on Kinetics of O<sub>2</sub> Uptake,” *Biophysical Journal* **18**, pp. 289–300.
4. Howard, A.D., Morton, J.B., Gad-el-Hak, M., and Pierce, D.B. (1978) “Sand Transport Model of Barchan Dune Equilibrium,” *Sedimentology* **25**, pp. 307–338.
5. Gad-el-Hak, M., and Morton, J.B. (1979) “Experiments on the Diffusion of Smoke in Isotropic Turbulent Flow,” *AIAA Journal* **17**, pp. 558–562.
6. Gad-el-Hak, M., Blackwelder, R.F., and Riley, J.J. (1981) “On the Growth of Turbulent Regions in Laminar Boundary Layers,” *Journal of Fluid Mechanics* **110**, pp. 73–95.
7. Gad-el-Hak, M., Davis, S.H., McMurray, J.T., and Orszag, S.A. (1984) “On the Stability of the Decelerating Boundary Layer,” *Journal of Fluid Mechanics* **138**, pp. 297–323.
8. Lin, J.-T., and Gad-el-Hak, M. (1984) “Turbulence Characteristics in Wind-Waves,” *Journal of Geophysical Research* **89**, no. C1, pp. 627–636.



9. Gad-el-Hak, M., Blackwelder, R.F., and Riley, J.J. (1984) "On the Interaction of Compliant Coatings with Boundary Layer Flows," *Journal of Fluid Mechanics* **140**, pp. 257–280.
10. Gad-el-Hak, M., and Blackwelder, R.F. (1985) "The Discrete Vortices from a Delta Wing," *AIAA Journal* **23**, pp. 961–962.
11. Gad-el-Hak, M., and Ho, C.-M. (1985) "The Pitching Delta Wing," *AIAA Journal* **23**, pp. 1660–1665.
12. Gad-el-Hak, M. (1986) "The Response of Elastic and Viscoelastic Surfaces to a Turbulent Boundary Layer," *Journal of Applied Mechanics* **53**, pp. 206–212.
13. Gad-el-Hak, M. (1986) "The Use of the Dye-Layer Technique for Unsteady Flow Visualization," *Journal of Fluids Engineering* **108**, pp. 34–38.
14. Gad-el-Hak, M. (1986) "Boundary Layer Interactions with Compliant Coatings: An Overview," feature article in *Applied Mechanics Reviews* **39**, pp. 511–524.
15. Gad-el-Hak, M., and Ho, C.-M. (1986) "Unsteady Vortical Flow Around Three-Dimensional Lifting Surfaces," *AIAA Journal* **24**, pp. 713–721.
16. Gad-el-Hak, M., and Ho, C.-M. (1986) "Unsteady Flow Around an Ogive-Cylinder," *Journal of Aircraft* **23**, pp. 520–528.
17. Gad-el-Hak, M., and Hussain, A.K.M.F. (1986) "Coherent Structures in a Turbulent Boundary Layer. Part 1: Generation of 'Artificial' Bursts," *Physics of Fluids* **29**, pp. 2124–2139.
18. Gad-el-Hak, M. (1987) "Compliant Coatings Research: A Guide to the Experimentalist," *Journal of Fluids and Structures* **1**, pp. 55–70.
19. Gad-el-Hak, M. (1987) "Unsteady Separation on Lifting Surfaces," feature article in *Applied Mechanics Reviews* **40**, pp. 441–453.
20. Gad-el-Hak, M. (1987) "The Water Towing Tank as an Experimental Facility: An Overview," *Experiments in Fluids* **5**, pp. 289–297.
21. Gad-el-Hak, M., and Blackwelder, R.F. (1987) "Control of the Discrete Vortices from a Delta Wing," *AIAA Journal* **25**, pp. 1042–1049.
22. Gad-el-Hak, M., and Blackwelder, R.F. (1987) "Simulation of Large-Eddy Structures in a Turbulent Boundary Layer," *AIAA Journal* **25**, pp. 1207–1215.
23. Riley, J.J., Gad-el-Hak, M., and Metcalfe, R.W. (1988) "Compliant Coatings," *Annual Review of Fluid Mechanics* **20**, pp. 393–420.
24. Gad-el-Hak, M. (1988) "Visualization Techniques for Unsteady Flows: An Overview," *Journal of Fluids Engineering* **110**, pp. 231–243.
25. Gad-el-Hak, M., and Blackwelder, R.F. (1989) "Selective Suction for Controlling Bursting Events in a Boundary Layer," *AIAA Journal* **27**, pp. 308–314.
26. Gad-el-Hak, M. (1989) "Flow Control," feature article in *Applied Mechanics Reviews* **42**, pp. 261–293.
27. Gad-el-Hak, M. (1990) "Large Gradients due to Wall Turbulence," in *Some Unanswered Questions in Fluid Mechanics*, eds. L.M. Trefethen and R.L. Panton, *Applied Mechanics Reviews* **43**, pp. 153–170.
28. Gad-el-Hak, M. (1990) "Control of Low-Speed Airfoil Aerodynamics," *AIAA Journal* **28**, pp. 1537–1552.
29. Xu, J.C., Sen, M., and Gad-el-Hak, M. (1990) "Low-Reynolds Number Flow Over a Rotatable Cylinder-Splitter Plate Body," *Physics of Fluids A* **2**, pp. 1925–1927.

30. Gad-el-Hak, M., and Bushnell, D.M. (1991) "Separation Control: Review," *Journal of Fluids Engineering* **113**, pp. 5–30.
31. Gad-el-Hak, M. (1992) "Splendor of Fluids in Motion," *Progress in Aerospace Sciences* **29**, pp. 81–123.
32. Xu, J.C., Sen, M., and Gad-el-Hak, M. (1993) "Dynamics of a Rotatable Cylinder with Splitter Plate in Uniform Flow," *Journal of Fluids and Structures* **7**, pp. 401–416.
33. Gad-el-Hak, M., and Bandyopadhyay, P.R. (1994) "Questions in Fluid Mechanics: Reynolds Number Effects in Wall-Bounded Flows," *Journal of Fluids Engineering* **116**, pp. 2–3.
34. Zaki, T.G., Sen, M., and Gad-el-Hak, M. (1994) "Numerical and Experimental Investigation of Flow Past a Freely Rotatable Square Cylinder," *Journal of Fluids and Structures* **8**, pp. 555–582.
35. Gad-el-Hak, M., and Bandyopadhyay, P.R. (1994) "Reynolds Number Effects in Wall-Bounded Flows," feature article in *Applied Mechanics Reviews* **47**, pp. 307–365.
36. Gad-el-Hak, M. (1994) "Interactive Control of Turbulent Boundary Layers: A Futuristic Overview," *AIAA Journal* **32**, pp. 1753–1765.
37. Gad-el-Hak, M., and Bandyopadhyay, P.R. (1995) "Field Versus Laboratory Turbulent Boundary Layers," *AIAA Journal* **33**, pp. 361–364.
38. Gad-el-Hak, M. (1995) "Questions in Fluid Mechanics: Stokes' Hypothesis for a Newtonian, Isotropic Fluid," *Journal of Fluids Engineering* **117**, pp. 3–5.
39. Gad-el-Hak, M., and Sen, M. (1996) "Fluid Mechanics in the Next Century," *Applied Mechanics Reviews* **49**, no. 3, pp. III–IV.
40. Bandyopadhyay, P.R., and Gad-el-Hak, M. (1996) "Rotating Gas-Liquid Flows in Finite Cylinders: Sensitivity of Standing Vortices to End Effects," *Experiments in Fluids* **21**, pp. 124–138.
41. Gad-el-Hak, M. (1996) "Modern Developments in Flow Control," *Applied Mechanics Reviews* **49**, pp. 365–379.
42. Sen, M., Wajerski, D., and Gad-el-Hak, M. (1996) "A Novel Pump for MEMS Applications," *Journal of Fluids Engineering* **118**, pp. 624–627.
43. Gad-el-Hak, M. (1996) "Compliant Coatings: A Decade of Progress," *Applied Mechanics Reviews* **49**, no. 10, part 2, pp. S147–S157.
44. Gad-el-Hak, M., and Leissa, A.W. (1997) "Introduction to Hans W. Liepmann's retrospective 'Boundary Layer Transition: The Early Days'," *Applied Mechanics Reviews* **50**, no. 2, pp. R1–R4.
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## VI. Refereed Meeting Articles and Abstracts

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28. Gad-el-Hak, M. (2018) “Climate Change: A Wicked Problem: Complexity and Uncertainty at the Intersection of Science, Economic, Politics, and Human Behavior,” (Author: F. P. Incropera), *AIAA Journal* **56**, pp. 443–444.

## IX. Invited Lectures

1. Ain Shams University, Cairo, Egypt. (Invited twice.)
2. Johns Hopkins University, Baltimore, MD. (Invited thrice.)
3. University of Colorado, Boulder, CO. (Invited thrice.)
4. University of Rochester, Rochester, NY.
5. Texas A&M University, College Station, TX.
6. University of Houston, TX.
7. Rice University, Houston, TX.
8. California Institute of Technology, Pasadena, CA. (Invited thrice.)
9. University of Southern California, Los Angeles, CA. (Invited thrice.)
10. University of California, Los Angeles, CA. (Invited twice.)
11. McDonnell-Douglas Research Laboratories, St. Louis, MO.
12. University of Virginia, Charlottesville, VA. (Invited thrice.)
13. Pennsylvania State University, University Park, PA. (Invited five times.)
14. George Mason University, Fairfax, VA.
15. Flow Research Company, Kent, WA.
16. University of Washington, Seattle, WA. (Invited four times.)
17. National Bureau of Standards, Gaithersburg, MD.
18. Ege University, Izmir, Turkey.
19. NASA—Ames Research Center, Moffett Field, CA. (Invited twice.)
20. Stanford University, Stanford, CA. (Invited twice.)
21. University of Stuttgart, Germany. (Invited twice.)
22. National Maritime Institute, Middlesex, England.
23. University of Notre Dame, South Bend, IN.
24. The Boeing Company, Seattle, WA. (Invited twice.)
25. National Academy of Sciences, Washington, D.C.
26. The Norwegian Institute of Technology, Trondheim, Norway.

27. Naval Ship Research and Development Center, Bethesda, MD.
28. Naval Research Laboratory, Washington, D.C.
29. Naval Postgraduate School, Monterey, CA.
30. Université d'Aix-Marseille II, Marseille, France. (Invited thrice.)
31. Rutgers University, New Brunswick, NJ.
32. Gould Corporation, Newport, RI.
33. Naval Underwater Systems Center, Newport, RI.
34. Naval Underwater Systems Center, New London, CT.
35. Air Force Institute of Technology, Dayton, OH.
36. Southwest Research Institute, San Antonio, TX. (Invited twice.)
37. University of Cincinnati, OH.
38. Mathematical Sciences Northwest, Bellevue, WA.
39. Air Force Academy, Colorado Springs, CO.
40. University of Michigan, Ann Arbor, MI. (Invited twice.)
41. Michigan State University, East Lansing, MI. (Invited thrice.)
42. Washington State University, Pullman, WA.
43. Northwestern University, Evanston, IL.
44. Brown University, Providence, RI. (Invited twice.)
45. San Diego State University, San Diego, CA. (Invited twice.)
46. University of California, San Diego, CA. (Invited twice.)
47. University of New Mexico, Albuquerque, NM.
48. Air Force Weapons Laboratory, Kirtland AFB, NM.
49. Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, OH.
50. Ford Motor Company, Detroit, MI.
51. Illinois Institute of Technology, Chicago, IL. (Invited twice.)
52. Air Force Office of Scientific Research, Bolling AFB, Washington, DC.
53. Office of Naval Research, Alexandria, VA.
54. Naval Sea Systems Command, Washington, DC.
55. Princeton University, Princeton, NJ. (Invited twice.)
56. University of Arizona, Tucson, AZ.
57. Old Dominion University, Norfolk, VA.
58. Virginia Polytechnic Institute & State University, Blacksburg, VA. (Invited twice.)
59. Ohio State University, Columbus, OH.

60. University of Texas, Austin, TX. (Invited twice.)
61. State University of New York, Buffalo, NY. (Invited four times.)
62. National Institute of Health, Bethesda, MD.
63. University of Oregon, Eugene, OR.
64. NASA—Lewis Research Center, Cleveland, OH. (Invited twice.)
65. Western Michigan University, Kalamazoo, MI. (Invited four times.)
66. University of Nevada, Reno, NV.
67. NASA—Langley Research Center, Hampton, VA. (Invited four times.)
68. Federal Institute of Technology (ETHZ), Zürich, Switzerland.
69. International Association for Hydraulic Research (IAHR), Davos, Switzerland.
70. Cortana Corporation. (Invited four times.)
71. Defense Advanced Research Project Agency.
72. University of Miami, Miami, FL.
73. University of Toronto, Toronto, Canada. (Invited twice.)
74. Cornell University, Ithaca, NY.
75. Institute of Hydromechanics, Kiev, USSR.
76. Institute of Thermophysics, Novosibirsk, USSR.
77. Institute of Physics and Technology, Moscow, USSR.
78. Academy of Scientific Research and Technology, Cairo, Egypt.
79. Arab Organization for Industrialization, Cairo, Egypt.
80. Arab Institute for Aviation Technology, Mokattam, Egypt.
81. Aircraft Factory, Helwan, Egypt.
82. Missile Factory, Heliopolis, Egypt.
83. Cairo University, Cairo, Egypt. (Invited seven times.)
84. American University in Cairo, Cairo, Egypt.
85. Lewis Research Academy, Cleveland, OH.
86. Cambridge University, Cambridge, England. (Invited twice.)
87. U.S. Office of Naval Research - London Branch, London, England.
88. Institut de Mécanique de Grenoble, Grenoble, France.
89. Royal Institute of Technology, Stockholm, Sweden. (Invited thrice.)
90. Institut de Mécanique Statistique de la Turbulence, Marseille, France.
91. École Centrale de Lyon, Lyon, France. (Invited six times.)
92. Technische Universität Dresden, Dresden, Germany.

93. Institut für Theoretische Physik, Dresden, Germany.
94. Technische Universität Berlin, Berlin, Germany. (Invited five times.)
95. Max-Planck-Institut für Strömungsforschung, Göttingen, Germany.
96. Institut National Polytechnique de Grenoble, Grenoble, France.
97. Université de Poitiers, Poitiers, France. (Invited four times.)
98. Arizona State University, Tempe, AZ.
99. Naval Undersea Warfare Center, Newport, RI. (Invited thrice.)
100. Technological University of Delft, Delft, The Netherlands.
101. École Polytechnique, Paris, France.
102. École Polytechnique Federale de Lausanne, Lausanne, Switzerland.
103. Georgia Institute of Technology, Atlanta, GA. (Invited twice.)
104. Purdue University, West Lafayette, IN. (Invited twice.)
105. Centre de Recherche en Calcul Appliqué, Montréal, Québec, Canada.
106. University of Ottawa, Ottawa, Ontario, Canada. (Invited twice.)
107. Carleton University, Ottawa, Ontario, Canada.
108. Southern University, Baton Rouge, LA.
109. University of Illinois, Urbana, IL.
110. University of California, Irvine, CA.
111. World User Association in Applied Computational Fluid Dynamics, Freiburg, Germany. (Invited twice.)
112. Université de Corte, Cargèse, Corsica, France.
113. Université de Nice, Sophia-Antipolis, France.
114. Institut d'Etudes Scientifiques de Cargèse, Corsica, France.
115. Syracuse University, Syracuse, New York.
116. Forschungszentrum Rossendorf, Dresden, Germany. (Eight lectures.)
117. Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany. (Invited four times.)
118. Chalmers University of Technology, Göteborg, Sweden. (Invited five times.)
119. Lulea University of Technology, Lulea, Sweden. (Invited twice.)
120. NOESIS Incorporated, Arlington, Virginia.
121. Surface Warfare Officers School, Newport, Rhode Island.
122. Iowa Institute of Hydraulic Research, University of Iowa, Iowa City, Iowa.
123. University of Tokyo, Tokyo, Japan. (Invited twice.)
124. Kyoto University, Kyoto, Japan.

125. Seoul National University, Seoul, South Korea.
126. Wayne State University, Detroit, Michigan.
127. University of Maryland, College Park, MD. (Invited thrice.)
128. Oklahoma State University, Stillwater, OK. (2000 Southwest Mechanics Lecture Series.)
129. University of Oklahoma, Norman, OK. (2000 Southwest Mechanics Lecture Series.)
130. University of Texas, Arlington, TX. (2000 Southwest Mechanics Lecture Series.)
131. Southern Methodist University, Dallas, TX. (2000 Southwest Mechanics Lecture Series.)
132. Warwick University, Coventry, United Kingdom. (Invited twice.)
133. Technische Universität München, München, Germany. (Invited thrice.)
134. Institut für Mikrotechnik, Mainz, Germany.
135. Universität Bremen, Bremen, Germany.
136. Philipps-Universität Marburg, Marburg, Germany.
137. Virginia Commonwealth University, Richmond, Virginia. (Invited four times.)
138. National Science Foundation, Washington, D.C. (Invited twice.)
139. Von Kármán Institute, Brussels, Belgium. (Four lectures.)
140. Ecole Supérieure de Physique et de Chimie Industrielles, Paris, France.
141. Polish Academy of Sciences, Warsaw, Poland.
142. Rzeszów University of Technology, Rzeszów, Poland. (Invited twice.)
143. Duke University, Durham, North Carolina.
144. Universität Karlsruhe, Karlsruhe, Germany.
145. Università di Roma la Sapienza, Rome, Italy. (Invited twice.)
146. Politecnico di Torino, Turin, Italy. (Invited twice.)
147. Embry-Riddle Aeronautical University, Daytona Beach, Florida.
148. University of Delaware, Newark, Delaware.
149. National University of Singapore, Singapore. (Five lectures.)
150. Indiana University–Purdue University Indianapolis, Indianapolis, Indiana.
151. National Research Council, Ottawa, Ontario, Canada.
152. Università degli Studi di Genova.
153. University of Peking, Beijing, China. (Invited four times.)
154. Université des Sciences et de la Technologie Houari Boumediène, Algiers, Algeria. (Invited thrice.)
155. Polytechnic Military School, Algiers, Algeria.
156. California State University at Los Angeles, Los Angeles, California.
157. Brandenburgische Technische Universität Cottbus, Cottbus, Germany. (Invited five times.)



158. Université de Valenciennes, Valenciennes, France. (Invited thrice.)
159. George Washington University, Washington, DC.
160. Indian Institute of Technology Roorkee, India. (Invited twice.)
161. Indian Institute of Technology Delhi, India. (Invited twice.)
162. Universidade Estadual Paulista (UNESP), Ilha Solteira, Brazil. (Invited thrice.)
163. Universidade Federal do Rio de Janeiro (UFRJ), Rio de Janeiro, Brazil.
164. Texas Tech University, Lubbock, Texas. (Invited twice.)
165. New York University, New York, New York.
166. Texas A&M University Qatar, Doha, Qatar. (Invited twice.)
167. University of Minnesota, Minneapolis, Minnesota.
168. Universidad Nacional Autónoma de México (UNAM), Mexico City, Mexico.
169. American Society of Mechanical Engineers' Distinguished Lecturer Program: Central Virginia Section, Richmond, Virginia; Canaveral Section, Melbourne, Florida; Florida Section, Orlando, Florida; North Texas Section, Richardson, Texas; Piedmont–Carolina Section, Charlotte, North Carolina; Midlands Section, Columbia, South Carolina; Delaware Section, Wilmington, Delaware; North Puget Sound Section, Everett, Washington; Northern Virginia Section, Fairfax, Virginia; Central Texas Section, Austin, Texas; Instituto Tecnológico Superior de Irapuato Section, Irapuato, Guanajuato, Mexico; Miami Section, Miami, Florida; Central Indiana Section, Indianapolis, Indiana.

Total of 313 invited lectures, when multiple visits are counted.

## Grants & Research Contracts

Mohamed Gad-el-Hak has been an Investigator for 110 research programs, externally funded at over \$18 million during the period 1973–2017. Research funds were secured from industry, from U.S. government agencies such as AFOSR, DARPA, EPA, NASA, NIH, NSF, NUSC (now NUWC), ONR and NRC, and from foreign governments such as Algeria, China, Egypt, France, Germany, India, Italy, Poland, Qatar Singapore, Sweden and United Kingdom.

<b>Sponsor</b>	<b>Title</b>	<b>Role</b>	<b>Budget</b>	<b>Date</b>
NSF	Isotropic Turbulence	Investigator	\$400K	1968–72
ONR	Turbulence Research	Investigator	\$400K	1968–72
EPA	Environmental Water Tunnel	Investigator	\$250K	1973–73
NSF	Turbulent Thermals	Investigator	\$100K	1973–74
NASA—Ames Research Center	Martian Sand Formations	Investigator	\$200K	1974–76
NSF	Turbulent Diffusion	Investigator	\$200K	1974–76
NIH	Blood Flow	Investigator	\$100K	1974–76
U.S. Navy	Hydrodynamic Signature of Submarines	Task Manager	\$5M	1976–80
Coast Guard	Oil Spills	Task Manager	\$200K	1976–78
AFOSR	Turbulent Spots	Principal Investigator	\$350K	1979–81
NASA—Ames Research Center	Decelerating Boundary Layers	Principal Investigator	\$60K	1981–81
ONR	Compliant Coatings	Principal Investigator	\$500K	1981–85
AFOSR	Unsteady Aerodynamics	Principal Investigator	\$310K	1982–85
Southwest Research Institute	Hazards Chemical Spills	Principal Investigator	\$30K	1983–83
Weyerhaeuser Company	Wall Jets in Paper Making	Principal Investigator	\$10K	1983–83
NUSC	Heated Underwater Vehicles	Principal Investigator	\$150K	1983–85
Boeing Company	Helicopter Aerodynamics	Principal Investigator	\$55K	1984–84
AFOSR	Control of Delta Wings	Principal Investigator	\$75K	1985–85
NASA—Langley Research Center	Burst Generation/ Drag Reduction	Principal Investigator	\$350K	1985–87

<b>Sponsor</b>	<b>Title</b>	<b>Role</b>	<b>Budget</b>	<b>Date</b>
NASA—Langley Research Center	Airborne Laser Platform	Principal Investigator	\$50K	1986–86
NSF	Drag Reduction	Principal Investigator	\$40K	1986–86
Flow Industries, Inc.	Study of Selective Suction on Bursting Phenomenon	Principal Investigator	\$108K	1986–88
University of Notre Dame	Unsteady Water Tunnel	Principal Investigator	\$100K	1986–90
NUSC	Drag and Noise Reduction	Principal Investigator	\$3K	1989–89
Cortana Corporation	Flow over Moving Wavy Walls	Principal Investigator	\$20K	1989–90
National-Standard Corporation	Fiber Drying Systems	Principal Investigator	\$3K	1990–90
UN' TOKTEN Program	R&D in Egyptian Industry	Principal Investigator	\$10K	1991–91
ONR	Compliant Coating Research in the Soviet Union	Principal Investigator	\$8K	1991–91
DARPA	Compliant Coating Research in the Soviet Union	Principal Investigator	\$10K	1991–91
Ministère de la Recherche et de la Technologie, France	Boundary Layer Control	Principal Investigator	\$20K	1991–92
NATO	Flow Control	Principal Investigator	\$20K	1991–92
ONR	Reynolds Number Effects in Turbulence	Principal Investigator	\$20K	1993–93
CFD Research Corporation	Control of Forebody Vortices on an F-16 Aircraft	Principal Investigator	\$2K	1993–93
Université de Poitiers	Unsteady Separation	Principal Investigator	\$20K	1994–94
Weldun International	Rapid Pressurization of Argon Gas	Principal Investigator	\$4K	1994–94
NSF	A Novel Method for Micropumping	Principal Investigator	\$40K	1995–96

<b>Sponsor</b>	<b>Title</b>	<b>Role</b>	<b>Budget</b>	<b>Date</b>
Ministère de la Recherche, France	Unsteady Separation	Principal Investigator	\$20K	1995–95
Various Sponsors	Flow Control: Fundamentals and Practices	Principal Investigator	\$75K	1996–96
Deutsche Forschungsgemeinschaft	Magnetohydrodynamics	Principal Investigator	\$10K	1997
Swedish Research Council	Microsensors	Principal Investigator	\$5K	1997
ASME	Freeman Scholarship	Awardee	\$10K	1998
Various Sponsors	Annual Meeting American Physical Society (DFD)	Chair	\$300K	1998–99
Swedish Research Council	Theory of Shear-Stress Sensors	Principal Investigator	\$5K	1999
National Research Council	Lie Group Theory	Principal Investigator	\$3K	1999
NASA—Glenn Research Center	Flow Control and Noise Reduction	Principal Investigator	\$3K	1999
CFD Corporation	Twin-Tail Buffet Research of Fighter Aircraft	Principal Investigator	\$7K	1999
United Technologies Research Center	Active Control of Separation	Principal Investigator	\$2K	1999
Ministry of Transport of Japan	Research Award for Foreign Scholars	Awardee	\$5K	1999
Seoul National University	Micro/Nano Scale Mechanical Engineering	Awardee	\$4K	1999
German Government	Alexander von Humboldt Prize	Awardee	\$100K	1999–02
State of Indiana 21st Century Research & Technology Fund	Development of a Microfluidics-Based Monitoring System	Investigator	\$1.9M	2000–02
Bayer Corporation	Development of a Microfluidics-Based Monitoring System	Investigator	\$50K	2000–02

<b>Sponsor</b>	<b>Title</b>	<b>Role</b>	<b>Budget</b>	<b>Date</b>
General Electric Corporation	Learning Module for Microelectromechanical Systems	Principal Investigator	\$60K	2001-02
Technische Universität Berlin	Sonderforschungsbereich	Principal Investigator	\$5k	2003
Politecnico di Torino	I Tre Centenari dell'Aeronautica a Torino	Principal Investigator	\$5K	2003
Deutsche Forschungsgemeinschaft	Nano- and Microfluidics	Principal Investigator	\$10K	2003
NSF	The Experiential Learning Library	Investigator	\$100K	2003-04
Engineering Conference International	Conference on Transport Phenomena in Micro- and Nanodevices	Chair	\$150K	2003-04
NSF	Workshop on Transport Phenomena in Micro- and Nanodevices	Principal Investigator	\$25K	2004
National University of Singapore	Workshop on Transition and Turbulence Control	Chair	\$100K	2004
NSF	U.S.-Egypt Workshop on Predictive Methodologies for Global Weather Related Disasters	Co-Principal Investigator	\$60K	2005
Engineering Conference International	Second International Conference on Transport Phenomena in Micro- and Nanodevices	Chair	\$150K	2005-06
NSF	Second International Conference on Transport Phenomena in Micro- and Nanodevices	Principal Investigator	\$20K	2006
Government of China	Visit to University of Peking	Principal Investigator	\$20K	2007
Government of Algeria	Visit to Université des Sciences et de la Technologie	Principal Investigator	\$20K	2007
National Institutes of Health	Computer Modeling in Cardiopulmonary Dynamics	Investigator	\$800K	2007-12

<b>Sponsor</b>	<b>Title</b>	<b>Role</b>	<b>Budget</b>	<b>Date</b>
Nuclear Regulatory Commission	New Undergraduate Nuclear Engineering Track Within the VCU Department of Mechanical Engineering	Principal Investigator	\$140K	2008–09
Government of Germany	Visit to Brandenburgische Technische Universität Cottbus	Principal Investigator	\$5K	2009
Government of France	Visit to Université de Valenciennes	Principal Investigator	\$15K	2009
Nuclear Regulatory Commission	A New Undergraduate Nuclear Engineering Degree at Virginia Commonwealth University	Principal Investigator	\$260K	2009–10
Government of China	Visit to University of Peking	Principal Investigator	\$20K	2009
Government of India	Visits to Indian Institute of Technology Roorkee & Indian Institute of Technology Delhi	Principal Investigator	\$20K	2010
Defense Advanced Projects Agency (DARPA)	Longevity and Noise-Reduction Characterization of a Superhydrophobic Nanofibrous Material Fabricated Using AC-Electrospinning	Principal Investigator	\$250K	2010–2011
Defense Advanced Projects Agency (DARPA)	Longevity and Noise-Reduction Characterization of a Superhydrophobic Nanofibrous Material Fabricated Using AC-Electrospinning—Part II	Principal Investigator	\$25K	2012
Crowgey, Hezel, and Cassis, PLLC Law Firm	Expert Witness	Principal Investigator	\$12K	2013
NEI Corporation	Material Characterizations	Principal Investigator	\$8K	2013
Qatar Foundation	Visit and Lecture in Education City	Principal Investigator	\$20K	2015
Qatar National Research Fund	Meeting Qatar’s Water Needs Using a Novel Desalination Approach With Enhanced Efficiency	Principal Investigator	\$1M	2016–2019

<b>Sponsor</b>	<b>Title</b>	<b>Role</b>	<b>Budget</b>	<b>Date</b>
Government of China	Visit to University of Peking	Principal Investigator	\$20K	2016

## Summary of Scholarly Accomplishments

**Mohamed Gad-el-Hak** has been described as original, pioneering, visionary, creative, indefatigable, non-conformist, having breadth and depth, and ahead of the curve. His teaching is innovative, rigorous, and does not appeal to the lowest common denominator, and his research is always leading edge. One of Professor Gad-el-Hak unique accomplishments is his ability to invent a novel measuring technique where none existed. He has done that with laser-induced fluorescence, compliant coating deformation, wind-waves characterizations, viscous micropumping, superhydrophobic surface longevity, amount of entrapped air, and microscale thickness, among others. The few examples below illustrate those points.

1. Authored the first archival paper (1981) to describe the laser-induced fluorescence (LIF) flow visualization technique. The novelty lies in the ability to generate a very thin sheet of laser light as to be able to see one plane at a time, and the use of extremely small amounts of fluorescent dye as not to make the fluid's interior opaque. Among the technique's advantages are its high signal-to-noise ratio and its ability to dissect the flow field, as a CAT scan would to solid objects. LIF is now routinely used in numerous laboratories around the world, for both gas and liquid flows in broad ranges of Mach and Reynolds numbers.
2. First to place the fledgling field of microfluidics on firm physical ground. His 1999 paper comprehensively accomplishing that feat has been cited 1,635 times. Whole books, courses, and funding programs sprang worldwide as a result of this single paper.
3. His work on Reynolds number effects in turbulent boundary layers, first published in 1994 and continuing throughout the 2000s, marked a significant paradigm shift in the subject. Funding programs in DARPA, ONR, and AFOSR were inspired by Gad-el-Hak's (1994) groundbreaking paper.
4. Conducted the seminal experiments that detailed the fluid-compliant surface interactions in turbulent boundary layers. He also introduced a non-invasive technique to probe the coating's instability waves. The laser-based probe has a spatial resolution of 1 micron and temporal resolution of several kHz.
5. Introduced the concept of selective/targeted/opposition control to achieve drag reduction, lift enhancement, noise suppression, and mixing augmentation in wall-bounded flows. This patented closed-loop control is now researched intensively around the world. Entire scientific conferences and funding programs are dedicated to reactive (in contrast to active) control.
6. Identified the mechanism by which a turbulent region grows into a laminar, vortical flow. The efficient growth by destabilization mechanism is an order of magnitude more effective than the conventional entrainment process in which a turbulent region incorporates/engulfs the surrounding irrotational flow.
7. Developed a novel viscous pump suited for microelectromechanical systems (MEMS) applications. Inertial pumps do not work at low Reynolds numbers. The only type that worked for MEMS, prior to introducing Gad-el-Hak's rotary pump, was of the reciprocating variety.
8. Gad-el-Hak's recent work on large-scale disasters resulted in the establishment of a universal metric by which the severity of all natural and manmade disasters is measured. His book on the subject was the first in the U.S. and second in the world to view large-scale disasters from the physical point of view, in contrast to the social, logistical, or medical viewpoints.
9. He was among the first group of aerodynamicists in the United States to work on the 'supermaneuverability' research program, a word coined by a German aerodynamicist. The DARPA/AFOSR unsteady aerodynamics program formed the foundation of the millions of unmanned aerial vehicles (UAV) flying today.
10. Gad-el-Hak's recent analytical, numerical, and experimental research on superhydrophobic coatings resulted in better understanding of the fledgling field. Twenty journal publications, including two invited review articles, resulted from our three-year effort. Two measurement techniques were introduced for the first time: (i) an in situ, noninvasive probe to assess the longevity of such coatings; and (ii) a method to measure the coating's thickness down to the microscale as well as the amount of entrapped air in the coating's micropockets.



11. Gad-el-Hak's research covers an extraordinary range of Reynolds, Mach, and Knudsen numbers. His recent work on hypersonic flows identified a new principle for aerodynamic heating. The resulting journal papers were independently highlighted in 2018 by two prestigious publications: American Institute of Physics' *SciLight*, and Oxford's *National Science Review*.
12. He initiated a nuclear engineering program within the VCU Department of Mechanical Engineering, which he chaired from 2002 to 2009. The unit is now renamed 'Department of Mechanical & Nuclear Engineering', and is the only one in the state of Virginia that offers bachelor's, master's, and doctoral degrees in both disciplines.
13. Gad-el-Hak is the first engineering professor to develop and teach a writing course for advanced undergraduate and beginning graduate students in science and engineering. The class is writing intensive and, through assessments, has proven to be more effective than similar classes taught by English and communications faculty. The semester-long course has also been offered as a short course in other universities around the world.
14. An essay Gad-el-Hak penned for *The Chronicle of Higher Education*, "We Must Stop the Avalanche of Low-Quality Research", was chosen in 2011 by the British Science Council to be part of a standardized English examination.

Dr. Gad-el-Hak is the author of the book *Flow Control: Passive, Active, and Reactive Flow Management*, and editor of the books *Frontiers in Experimental Fluid Mechanics*, *Advances in Fluid Mechanics Measurements*, *Flow Control: Fundamentals and Practices*, *The MEMS Handbook* (first and second editions; in three volumes), *Transition and Turbulence Control*, and *Large-Scale Disasters: Prediction, Control, and Mitigation*.

Gad-el-Hak authored 141 journal papers and 52 essays in magazines and newspapers. He has been featured in NPR, PBS, Nature, and The New York Times. Additional to working in the broad field of mechanics, he penned essays and op/ed's on global warming, energy crisis, proliferation of scholarly publications, massive open online courses (MOOC), university governance, STEM and the humanities, engineering education, and societal values of basic research.

Gad-el-Hak's papers have been cited (as of July 2021) more than 16,315 times in the technical literature, and his h-index is 58, i10-index is 147, and i100-index is 32. <https://scholar.google.com/citations?user=OEHeMUKAAAAJ&hl=en&oi=ao>

Two of Gad-el-Hak's books have been translated into Chinese, and several of his articles/essays have been translated into Arabic, Chinese, the Czech language, French, German, Japanese, Russian, Spanish, and Turkish.

Professor Gad-el-Hak delivered over 313 invited lectures in 24 countries. He is a consultant to the United Nations, the governments of twelve countries, and numerous academic and industrial concerns.

Other notable achievements include being a fellow of five professional societies, a winner of the ASME Freeman Scholar award and Germany's Alexander von Humboldt prize, designation as an ASME Distinguished Lecturer, and induction into the Johns Hopkins University Society of Scholars. Gad-el-Hak has also been awarded the ASME Medal for seminal contributions to the discipline of fluids engineering, as well as a Certificate of Appreciation in testimony of the high regard of his associates and the deep appreciation of the society for his valued services in advancing the engineering profession. Gad-el-Hak is an editor of eight scholarly journals.

To honor Professor Gad-el-Hak, six academicians from three countries penned the editorial "Homage to a Legendary Dynamicist on His Seventy-Fifth Birthday". The article appeared in the July 2020 issue of the *Journal of Fluids Engineering*. <https://www.people.vcu.edu/~gadelhak/Homage.pdf>

## Related URLs

**Home Page:** <https://www.people.vcu.edu/~gadelhak/>

**Wikipedia:** [https://en.wikipedia.org/wiki/Mohamed\\_Gad-el-Hak](https://en.wikipedia.org/wiki/Mohamed_Gad-el-Hak)

**Google Scholar:** <https://scholar.google.com/citations?user=OEHeMUKAAAAJ&hl=en&oi=ao>

**Google Search:** <https://www.google.com/search?client=firefox-b-1-d&q=Mohamed+Gad-el-Hak>