

Prof Wei Shyy, President
The Hong Kong University of Science and Technology (HKUST)

Professor Wei Shyy assumed the presidency of HKUST on 1 September 2018.

Professor Shyy first joined HKUST in August 2010 as Provost and Chair Professor of Mechanical and Aerospace Engineering. Prior to joining HKUST, Professor Shyy was Clarence L. “Kelly” Johnson Collegiate Professor and Chairman of the Department of Aerospace Engineering of the University of Michigan.

Professor Shyy obtained his BS degree from Tsing-Hua University, Taiwan, and his MSE and PhD degrees in Aerospace Engineering from University of Michigan. Professor Shyy has supervised and hosted many PhD students as well as postdoctoral fellows and visiting scholars.

He is the author or a co-author of five books and numerous journal and conference articles dealing with computational and modeling techniques involving fluid flow and its associated design optimization issues, biological and low Reynolds number aerodynamics, energy and propulsion, and a broad range of topics related to aerial and space flight vehicles. He was the Principal Investigator of several multi-institutional research projects, funded by the US government and industries, on future space transport, bio-inspired flight, and computational aeronautical science. He is General Editor of the *Cambridge Aerospace Book Series* published by the Cambridge University Press, Co-Editor-in Chief of *Encyclopedia of Aerospace Engineering*, a major reference work published by Wiley-Blackwell.

Professor Shyy is a Fellow of the American Institute of Aeronautics and Astronautics (AIAA) and the American Society of Mechanical Engineers (ASME). He has received awards for his research and professional contributions, including the AIAA 2003 Pendray Aerospace Literature Award, the ASME 2005 Heat Transfer Memorial Award, and the Engineers’ Council (Sherman Oaks, CA) 2009 Distinguished Educator Award. As an alumnus, his accomplishments were also recognized by Tsing-Hua University, Taiwan and the University of Michigan. His professional views have been quoted in various news media, including the *New York Times*, the *Washington Post*, the *Associated Press*, the *USA Today*, the *Christian Science Monitor*, the *New Scientist*, the *US News & World Report*, and *SCMP*.

As an academic leader, Professor Shyy has consistently advocated broadening educational scope and approach, advancing research and knowledge transfer to help address global challenges. He is committed to promoting university’s societal engagement and independent, entrepreneurial spirit. He has also led efforts in fostering diverse and inclusive campus cultures to better reflect and support the university’s overall mission.

Motivated by his appreciation of the intrinsic beauty of natural flyers, Professor Shyy is an avid bird photographer. Some of his photos are compiled in an eBook, entitled "*Flight InSight*" available at: <http://ebookshelf.ust.hk/flippingbook/G18739/>

CITIZENSHIP

U.S.A.

EDUCATION

B.S. (1977), Power Mechanical Engineering, National Tsing-Hua University, Taiwan.

M.S.E. (1981) / Ph.D. (1982), Aerospace Engineering, University of Michigan.

EMPLOYMENT

Employment History

| | | | |
|-----------|---|------------|--|
| July 1977 | - | June 1979: | Military Service (Taiwan) |
| Aug 1979 | - | May 1982: | Graduate Research Assistant, University of Michigan |
| May 1982 | - | Apr 1983: | Post-doctoral Research Scholar, University of Michigan, and Consultant to Ford Motor Company and General Electric Company |
| May 1983 | - | Aug 1988: | Research Scientist, General Electric Research and Development Center, Schenectady, NY |
| Jan 1987 | - | Jun 1987: | Visiting Professor of Aeronautics and Astronautics, National Cheng-Kung University, Taiwan |
| Aug 1988 | - | Jul 1992: | Associate Professor of Aerospace Engineering, Mechanics and Engineering Science, University of Florida |
| Jul 1992 | - | Jun 2002: | Professor of Aerospace Engineering, Mechanics and Engineering Science, University of Florida |
| Jan 1996 | - | Jun 2002: | Professor and Chairman of Aerospace Engineering, Mechanics and Engineering Science Department, University of Florida |
| Jul 2002 | - | Jun 2004: | Professor and Chairman of Mechanical and Aerospace Engineering Department (merged between Mechanical Engineering Department, and Aerospace Engineering, Mechanics and Engineering Science Department), University of Florida |
| Jul 2004 | - | Dec 2004: | Distinguished Professor and Chairman of Mechanical and Aerospace Engineering Department, University of Florida |
| Jan 2005 | - | Aug 2010: | Clarence L. "Kelly" Johnson Collegiate Professor and Chairman of Aerospace Engineering Department, University of Michigan |
| Fall 2010 | - | Aug 2013: | Provost, Hong Kong University of Science and Technology |
| Sep 2013 | - | Present: | Executive Vice-President & Provost, Hong Kong University of Science and Technology |

Consulting Experiences

- BDM Federal
- Chung Shan Institute of Science and Technology (Taiwan)
- Dominion Engineering Works
- Ford Scientific Research Laboratory
- Ford Powertrain Division
- GE Research and Development Center
- GE Lighting
- GE Aircraft Engines
- Gould, Lewis & Proctor
- Industrial Technology Research Institute (Taiwan)
- Lockheed Martin / GE Aerospace

- NASA
- OSRAM Sylvania
- Pratt & Whitney
- National Science Foundation (Committee of Visitors)
- Prairie View A&M University
- ZONA Technology

Teaching Experiences

- Undergraduate: Engineering Analysis: Differential Equations II; Fluid Mechanics; Aerospace Propulsion
- Graduate: Numerical Methods; Fluid Mechanics; Turbulent Fluid Flow; Thermo-fluid Dynamics for Space Applications; Computational Fluid Dynamics; Viscous Flows

Ph.D. Students Advised as Chair or Co-chair (the year the student graduated)

1. S.-J. Liang (1993) A Study of Free and Moving Boundary Problems Involving Thin Crystal Growth
2. S. Thakur (1993) Treatment of Convection in Sequential Solvers for Navier-Stokes Equations
3. J.A. Wright (1993) A Pressure-Based Composite Grid Method for Complex Fluid Flows
4. E.L. Blosch (1994) Pressure-Based Methods on Single-Instruction Stream / Multiple-Data Stream Computers
5. H.S. Udaykumar (1994) A Mixed Eulerian-Lagrangian Approach for the Simulation of Interfacial Phenomena in Solidification Processing
6. R. Smith (1994) A Viscous Flow Based Membrane Wing Model
7. J. Liu (1996) Multiblock Computations and Turbulence Modeling for Turbomachinery Flows
8. H. Ouyang (1996) Multilevel Simulation and Modeling of Vertical Bridgman Growth of Single Crystals and Solidification of Binary Alloys
9. M. Rao (1996) Computational Modeling of Phase Change, Convective Heat Transfer and Free Surface Flow in Solidification Processing
10. V. Krishnamurty (1996) Effect of Compressibility on the Turbulence Structure and Its Modeling
11. J.K. Clutter (1997) Computation of High Speed Reacting Flows
12. H-C Kan (1997) Computational Study of Leukocyte Rheology Based on a Multilayer Model (co-chair)
13. A. Martin (1997) Multiscale Modeling of Heat Transfer Enhancement with Fiber Array Inserts (co-chair)
14. N. C. Prewitt (1999) Parallel Computing of Overset Grids for Aerodynamic Problems with Moving Objects
15. G. L. Abate (1999) Experimental Investigations of Shock Waves Undergoing Sudden Expansion in a Confined Chamber
16. N. Papila (2001) Neural Network and Polynomial-Based Response Surface Techniques for Supersonic Turbine Design Optimization
17. G. Chochua (2002) Computations of Gas Annular Damper Seal Flows
18. M. Francois (2002) Computations of Drop Dynamics with Heat Transfer
19. D. Yu (2002) Viscous Flow Computations with the Lattice-Boltzmann Equation Method (co-chair)
20. I. Senocak (2002) Computational Methodology for the Simulation of Turbulent Cavitating Flows.
21. N. N'dri (2002) Multi-Scale Computation in Hemodynamics (co-chair)
22. Y. Lian (2003) Membrane and Adaptively-Shaped Wings for Micro Air Vehicle
23. R. Vaidyanathan (2004) Investigation of Navier-Stokes Code Verification and Design Optimization

24. R. Kamakoti (2004) Computational Aeroelasticity Using a Pressure-Based Method
25. J. Wu (2005) Filter-Based Modeling for Turbulent Cavitating Flow Computations
26. Y. Utturkar (2005) Computational Modeling of Thermodynamic effects of Cryogenic Cavitation
27. M. Popescu (2005) A Finite-Volume, Cartesian Grid Method for Computational Aeroacoustics
28. B. Jayaraman (2006) Computational Modeling of Glow Discharge-Induced Fluid Dynamics
29. R.K. Singh (2006) Three-Dimensional Marker-Based Multiphase Flow Computation Using Adaptive Cartesian Grid Techniques
30. D. Viieru (2006) Flapping and Fixed Wing Aerodynamics of Low Reynolds Number Flight Vehicles
31. J. Chao (2006) Multi-Scale Computational Fluid Dynamics with Interfaces
32. E. Uzgoren (2006) Adaptive, Multi-Domain Techniques for Two-Phase Flow Computations
33. T. Goel (2007) Multiple Surrogates and Error Modeling in Optimization of Liquid Rocket Propulsion Components (co-chair)
34. Y. Mack (2007) CFD-Based Surrogate Modeling of Liquid Rocket Engine Components via Design Space Refinement and Sensitivity Assessment
35. X. Zhang (2009) Multiscale Modeling of Li-Ion Cells: Mechanics, Heat Generation and Electrochemical Kinetics (co-chair)
36. S. Chimakurthi (2009) A Computational Aeroelasticity Framework for Analyzing Flapping Wings (co-chair)
37. E. Sozer (2010) Modeling of Gaseous Reacting Flow and Thermal Environment of Liquid Rocket Injectors
38. C.-C. Tseng (2010) Modeling of Turbulent Cavitating Flows
39. J. Sim (2010) 3-D Adaptive Eulerian-Lagrangian Method for Multiphase Flows with Spacecraft Applications
40. Y.-C. Cho (2010) Low-Reynolds Number Adaptive Flow Control Using Dielectric Barrier Discharge Actuator
41. C.-K. Kang (2011) Aerodynamics, Scaling, and Performance of a Flexible Flapping Wing
42. P.C. Trizila (2011) Aerodynamics of Low Reynolds Number Rigid Flapping Wing Under Hover and Freestream Conditions
43. E. A. Hassan (2012) Multi-fluid Dynamics for Supersonic Jet-and-Crossflows and Liquid Plug Rupture
44. D. Yeo (2013) Aerodynamic Sensing for Autonomous Unmanned Aircraft Systems (co-chair)
45. W. Du (2013) Multi-Scale Modeling, Surrogate-Based Analysis, and Optimization of Lithium-Ion Batteries for Vehicle Applications
46. C-K Kuan (2013) Parallel processing of Eulerian-Lagrangian, Cell-Based Adaptive Method for Moving Boundary Problems
47. P. Tan (2016) Investigation of Non-Aqueous Lithium-Oxygen Batteries for Performance Improvement (co-chair)
48. J.-J. Fu (2017) Effects of Wing Morphology on Flapping-Wing Aerodynamics (co-chair)

RESEARCH

Prof. Shyy's research is centered on computational modeling techniques, which include continuum and lattice Boltzmann formulations. He has made substantial contributions to the formulations of the techniques needed for treating complex geometry, coupled multi-physics, moving and deformable boundaries, and fluid-fluid/fluid-structure interactions. A key feature is that his interest encompasses fundamental and application, including (i) development of original and novel numerical and modeling techniques for multidisciplinary problems related to thermo-fluid dynamics; (ii) computational and modeling techniques typically developed to a point that they have a

comprehensive capability to tackle original physical issues; (iii) consistent emphasis on close collaboration between theory/computation and experiment; (iv) extension of scientific research to address engineering issues arising from optimization, assessment and design tool development.

Overall, he has made substantial contributions to air and space flight vehicle research and development, fluid machinery design optimization, and computational methods for complex unsteady flows. To name but a few, he

- demonstrated, by combined computational modeling and experiment, and in collaboration with students and colleagues, the importance of membrane wings and flexible structures for low-Reynolds-number flight; also offered new insight into issues such as tip vortices, downwash, and kinematics associated with flapping wing vehicles.
- developed, with the collaborators, and working jointly with NASA Marshall and Boeing-Rocketdyne, a multidisciplinary approach (combining numerical simulations, surrogate models, and optimization techniques) to improve the efficiency and design of turbines for reusable launch vehicles (RLVs), including supersonic turbines for NASA's second generation RLVs and Moon/Mars endeavors. The tools developed have been applied by researchers in many other fields.
- developed the CONCERT computer code, the first 3D numerical model used by GE Aircraft Engines in the 1990s for gas turbine combustor flow analysis.
- made original contributions to computational moving boundary problems arising from engineering and science, including multiphase flows and drop collision/impact dynamics, cavitation for rocket and underwater propulsion, fluid-structures interactions for aerial vehicles and sail dynamics, spacecraft thermal management, cellular and bio-mechanical processes, and advanced materials processing.
- developed, in collaboration with colleagues of the Hong Kong University of Science and Technology, University of Michigan and General Motors, advanced predictive capability of and physical insight into materials sciences, mechanics, thermo-transport and multi-scale modeling of modern battery technologies for vehicle development.
- pioneered development of three-dimensional Navier-Stokes-based computer tools for hydraulic turbine flow analyses, including distributors, runners and draft tubes. Supervised Ph.D. studies and developed original cavitation models needed for, e.g., liquid rocket engines, hydraulic turbines and underwater propulsion.
- analyzed hydrocarbon emissions in spark-ignition engines which impacted IC engine design and changed the standard picture of when, where, and how the emissions occur. While previous wisdom contended that these occurred in the quench layer, he proved that these occur in crevices and oil layers, which was a completely new idea, and was confirmed experimentally.
- contributed, in collaboration with colleagues of Pratt & Whitney and Dresser-Rand, to turbomachinery heat transfer, including those related to leading edge film cooling, cavity heat transfer, supersonic nozzle heat transfer, and modern seal operation.
- investigated high temperature (about 6,000 K) heat transfer for high pressure discharge lamp, based on a model accounting for combined radiation, convection and conduction in equilibrium plasma and neutral fluids. The research has contributed to product design of GE and other industrial entities.
- conducted extensive research in solidification processing, materials manufacturing, and crystal growth, at both macroscopic and microscopic (morphological) levels in the areas of materials sciences. Spanning the scales from surface tension, conduction to convection and overall crystal sizes, his research has elucidated the rich and complex thermal physics associated with various processing techniques (including continuous casting, Bridgman, float zone, electron beam melting, plasma coating).

- contributed to issues in biomechanics including deformation and recovery of cellular (leukocyte) dynamics through capillary scale geometries, cell-receptor dynamics associated with cell adhesion and movement, liquid plug propagation in airways, and fluid flow through stenosed artery and bypass graft in an anastomosis.
- analyzed, with collaborators of GE Aerospace (later became part of Lockheed-Martin) capillary-pumped loop thermal management for spacecraft, and conducted original research on fluid physics, materials processing, and multiphase fluid dynamics for micro-gravity space environments.

As part of his professional activities, in 2002, he led a group to establish the Institute for Future Space Transport, a seven-university consortium funded by NASA, under the University Research, Engineering and Technology Institutes program (now called the Constellation University Institutes Program, CUIP). In 2006, he served as the principal investigator to lead the establishment of the Michigan/AFRL/Boeing Collaborative Center in Aeronautical Sciences (MAB-CCAS), a five-year endeavor sponsored by the Air Force Research Laboratory. In 2007, he was the principal investigator of a Multidisciplinary University Research Initiative (MURI) project, sponsored by DoD, on Biologically-Inspired, Anisotropic Flexible Wing for Optimal Flapping Flight. The foundations of Alcoa, Ford, and TRW selected him as a recipient for their unrestricted research grants, with no string attached and no deliverables required.

AWARDS & HONORS

- Fellow of American Institute of Aeronautics and Astronautics (AIAA) & American Society of Mechanical Engineers (ASME)
- General Electric Research and Development Center: Publications Award (1986)
- Chinese Society of Mechanical Engineers (Taiwan): Research Paper Award (1987)
- AIAA: Service Citation (1993)
- NASA Kennedy Space Center: Certificate of Appreciation (1999) & Productivity Award (1999)
- AIAA Pendray Aerospace Literature Award (2003) with the citation “For significant contributions to research and publications in computation and modeling techniques for a broad range of aerospace applications.”
- ASME Heat Transfer Memorial Award (2005), with the citation “For outstanding and archival contributions to the thermal sciences in a number of areas including modeling of phase-change and moving boundary heat transfer problems, convective flows in complicated domain, air-breathing and rocket combustion, materials thermal processing, and turbo-machinery flows.”
- Listed in Who's Who in America (since 1993), Who's Who in Science and Technology (since 1993), Who's Who in the World (since 1994), International Directory of Distinguished Leadership (since 1988), etc.
- Distinguished Alumnus Award, Department of Power Mechanical Engineering, National Tsing-Hua University (2009).
- The Engineers' Council (Sherman Oaks, CA): 2009 Distinguished Educator Award, with the citation “In Recognition of Outstanding Contributions to the Engineering Profession as a Teacher, Researcher, Mentor to Students and Staff, and Leader in Working Together with Industry.” <http://www.engineerscouncil.org/>
- The article entitled Effects of Nucleus on Leukocyte Recovery, published in *Annals of Biomedical Engineering*, Vol. 27, (1999), pp. 648-655, was featured as the Cover Article of the issue.
- The article entitled Evaluation of geometric conservation law using pressure-based fluid solver and moving grid technique published in *International Journal of Numerical Methods for Heat & Fluid Flow* (2004) was chosen as the Outstanding Paper Award Winner at the Literati Club Awards for Excellence 2005.

- The article entitled Multi-scale Thermo-fluid Transport in Porous Media, published in *International Journal of Numerical Methods for Heat & Fluid Flow* was chosen as a Highly Commended Award Winner at the Literati Network Awards for Excellence 2009.
- The article entitled Flow Structures of Gaseous Jets Injected into Water for Underwater Propulsion, published in *Acta Mechanica Sinica*, Vol. 27, (2011), pp.461-472, was featured as the Focused Paper of the issue.
- The article entitled Effects of Flexibility on the Aerodynamic Performance of Flapping Wings, published in *Journal of Fluid Mechanics*, Vol. 689, (2011), pp. 32-74, was featured as the Cover Article of the issue.
- Distinguished Alumnus Award, National Tsing-Hua University (2013).
- University of Michigan 2013 Alumni Merit Award for the Department of Aerospace Engineering.

OTHER PROFESSIONAL ACTIVITIES

Guest Professor

- Chinese Academy of Sciences, Institute of Mechanics, since 2000
- Northwest Polytechnic University (China), since 2001
- Beijing Institute of Technology (China), since 2003
- Nanjing University of Aeronautics and Astronautics (China), since 2003
- Chiba University (Japan), since 2008
- Harbin Institute of Technology (China), since 2009

News Media Coverage

- The New York Times: Feb. 11, 2003
- The Christian Science Monitor: February 18, 2003
- USA Today: April 14, 2003
- The Orlando Sentinel: February 2, 2003
- The Miami Herald: February 06, 2003
- The St. Petersburg Times: March 10, 2003; April 13, 2003
- The Gainesville Sun: February 02, 2003
- The St. Paul Pioneer Press: July 13, 2005
- Minneapolis WCCO: July 13, 2005
- The Science Daily: 2008: <http://www.sciencedaily.com/releases/2008/02/080204172203.htm>
- Yahoo: http://news.yahoo.com/s/livescience/20080304/sc_livescience/manymysteriesofflightremain
- MSNBC 2008: <http://www.msnbc.msn.com/id/23466836/print/1/displaymode/1098/>
- Newhouse News Service 2008: <http://www.newhouse.com/birds-inspire-work-on-flapping-wing-vehicles-5.html>
- The Austrian Public Radio: February 26, 2009
- The US News & World Report: April 22, 2009: <http://www.usnews.com/articles/education/best-graduate-schools/2009/04/22/aerospace-engineering-searches-for-new-talent.html>
- http://www.takungpao.com/pdf/20110218-PDF/A22_Screen.pdf 訪科大首席副校長史維 : February 18, 2011
- <http://news.donga.com/Society/Education/3/0301/20110422/36610758/1> : April 22, 2011
- <http://tw.news.yahoo.com/article/url/d/a/110519/131/2rrxp.html> 遠見雜誌 - 華人高等教育論壇 : May 19, 2011

- http://cnnews.rti.org.tw/index_newsContent.aspx?nid=297406&id=8&id2=1 遠見雜誌 - 華人高等教育論壇 : May 19, 2011
- <http://www.lihpao.com/?action-viewnews-itemid-107239> 遠見雜誌 - 華人高等教育論壇 : May 19, 2011
- <http://www.libertytimes.com.tw/2011/new/may/19/today-life3.htm> 遠見雜誌 - 華人高等教育論壇
- Interview with Prof Wei Shyy on aerospace development (Wen Wei Po) July 6, 2011, <http://paper.wenweipo.com/2011/07/06/GJ1107060006.htm>
- The Washington Post: April 6, 2013
- The South China Morning Post: March 25, 2014
- First Magazine, Special Report Hong Kong 2014, p. 22-25
- <http://ziarulunirea.ro/1-aprilie-ziua-internationala-a-pasarilor-in-1906-a-fost-semnata-conventia-pentru-protectia-pasarilor-unul-din-primele-documente-ecologice-317784/> : March 31, 2015
- <http://hk.apple.nextmedia.com/realtime/news/20151219/54552110> 香港蘋果日報 - 【周末動人】哪一天會飛？微小型無人機專家觀鳥拆解飛行密碼 : December 19, 2015
- http://digitalpaper.stdaily.com/http_www.kjrb.com/kjrb/images/2016-08/11/08/DefPub2016081108.pdf 科技日報 - 【企業匯·科技金融】聽香港科技大學首席副校長講 – 別人家的孩子怎麼創業: August 11, 2016
- Soaring Bird Photos, Ming Pao Monthly (明報月刊) : February, 2017
- University World News: May 4, 2017
- <https://www.youtube.com/watch?v=L90pLQyRxcQ> TVB Pearl (Hong Kong) – [Open for Learning TV Programmes] OUHK Great Speakers Series: From Natural Flyers to Advances in Aerospace Engineering: September 10, 2017

Featured Speaker in Short Courses

- AIAA Short Course on Computational Methods in Combustion: Gas Turbines, Ramjets, and Scramjets (two-day course):
- (i) July 1990, Orlando, FL; (ii) June 1993, Monterey, CA.
- Short Course on Computational Fluid Dynamics for Internal and Reacting Flows, Chung Shan Institute of Science and Technology, Taiwan:
- (i) March 1992 (one-week course, in Lungtan); (ii) June 1993 (two-week course, in Taichung).
- Short Course on Computational Fluid Dynamics, Michigan, June 2000.
- Short Course on Numerical Code Verification, Lyon, France, July 2001.

Invited/Keynote/Plenary Lectures Since 2000

- 2000: (i) University of Pennsylvania; (ii) National High Performance Computing Center (Taiwan); (iii) 7th Computational Fluid Dynamics Conference (Taiwan); (iv) National Tsing-Hua University (Hsinchu, Taiwan); (v) Tsing-Hua University (Beijing, China); (vi) 13th International Conference on Domain Decomposition Methods (France); (vii) 2nd International Symposium on Fluid Machinery and Fluid Engineering in Beijing (China).
- 2001: (i) Northwest Polytechnic University (China); (ii) Beijing Institute of Technology (China); (iii) University of Lyon (France); (iv) Short Course on Code Verification in Lyon (France).
- 2002: (i) National Seoul University (Korea), (ii) Korean Advanced Institute of Science and Technology (KAIST); (iii) Inha University (Korea); (iv) 4th International Conference on Pumps and Fans (China); (v) Bauman Moscow State University (Russia); (vi) International Conference on Computational Engineering & Sciences (Reno, NV); (vii) University of Southampton (UK); (viii) Workshop on Aerodynamics of Unmanned Air Vehicles in University of Bath (UK).

- 2003: (i) 3rd International Conference on Computational Heat and Mass Transfer in Banff (Canada); (ii) Confederation of European Aerospace Societies Aerodynamics Conference, (London, UK); (iii) Second International Symposium on Aqua Bio-Mechanisms, Honolulu (USA); (iv) Tsing-Hua University (China); (v) Beijing Institute of Technology (China); (vi) Nanjing University of Aeronautics and Astronautics (China).
- 2004: (i) The University of Michigan; (ii) University of Illinois (Urbana-Champaign); (iii) Vanderbilt University; (iv) Iowa State University; (v) Ohio Aerospace Institute.
- 2005: (i) CFD 2005 - 4th International Conference on Computational Fluid Dynamics in the Oil and Gas, Metallurgical & Process Industries, 6 - 8 June, 2005, Trondheim, Norway; (ii) Tsing-Hua University (Beijing, China); (iii) Invited panelist at the Joint Army-Navy-NASA-Air Force (JANNAF) Joint Propulsion Meeting (JPM) Plenary Session, December 6 in Monterey, CA.
- 2006: (i) Beihang University (Beijing, China); (ii) Third International Symposium on Aqua Bio-Mechanisms, Okinawa (Japan); (iii) Hong Kong University of Science and Technology.
- 2007: (i) 5th International Conference on Computational Heat and Mass Transfer (Canmore, Canada); (ii) 14th Computational Fluid Dynamics Conference (Taiwan).
- 2008: (i) 46th AIAA Aerospace Sciences Meeting (Reno, NV); (ii) International Symposium on Biomimetics, Micro Air Vehicles, Unmanned Aerial Vehicles and Unmanned Vehicles (Chiba University, Japan); (iii) 18th Conference on Combustion Science and Technology (Taiwan); (iv) MIT; (v) Stanford University.
- 2009: (i) Tsing-Hua University (Beijing); (ii) Harbin Institute of Technology; (iii) Technical University of Delft; (iv) ASME International Mechanical Engineering Conference & Exhibit (panelist).
- 2010: (i) 50th Israel Annual Conference on Aerospace Sciences (plenary lecturer), Haifa, Israel, February 17-18; (ii) Technical University of Delft, USA; (iii) 2010 ONR-AFOSR Bio-inspired Autonomous Systems Review, Arlington, USA, May 19-21; (iv) Japanese Society of Mechanical Engineers (JSME) annual meeting; (v) 2010 International Conference on Intelligent Unmanned Systems, Bali, Indonesia, November 3-5.
- 2011: (i) Asian Aerospace Expo and Congress, Hong Kong, China, March 8-10; (ii) ASME/JSME 8th Thermal Engineering Joint Conference, Honolulu, USA, March 13-17; (iii) 遠見雜誌 - 華人高等教育論壇, Taipei, Taiwan, May 18; (iv) The 6th International Conference on Fluid Mechanics, Guangzhou, China, June 30 - July 3; (v) The Second International Conference on Computational Methods for Thermal Problems, Dalian, China, September 5-7; (vi) 11th International Conference on Fluid Control, Measurements, and Visualization, Keelung, Taiwan, December 5-9.
- 2012: (i) The Asian Joint Conference on Propulsion and Power 2012, Xi'an, China, March 1-4; (ii) Hong Kong Institution of Engineers, Aircraft Division 1st Annual General Meeting, Hong Kong, China, June 7; (iii) Chinese Academy of Science, Institute of Engineering Thermophysics, China, July 23-24; (iv) 8th International Conference on Intelligent Unmanned System, Singapore, October 22-24; (v) 5th ISFMFE (International Symposium on Fluid Machinery and Fluids Engineering), Jeju, Korea, October 24-27; (vi) Chinese Society of Mechanical Engineers, Kaohsiung, Taiwan, December 7-8.
- 2013: (i) Workshop on Droplet Dynamics and Interfacial Physics in Micro Devices, National Taiwan University, Taipei, Taiwan, January 15; (ii) Royal Aeronautical Society, Hong Kong, China, February 25; (iii) 5th National Forum of the Key Universities, the State Administration of Foreign Experts Affairs (China), Guangzhou, China, May 20; (iv) 2nd International Retreat on Vortex Dynamics and Vorticity Aerodynamics, Shanghai, China, August 16-17; (v) Department of Aerospace Engineering, University of Michigan, USA, October 2; (vi) 2013 International Workshop on Computational Science and Engineering, Taipei, Taiwan, October 14-15; (vii) 2013 International Biomimetics Symposium in Taiwan-Learn from the Nature, Taipei, Taiwan, November 12-13.

- 2014: (i) Coursera Partner's Conference, London, UK, March 31 - April 1; (ii) International Congress on Trends in Higher Education, Istanbul, Turkey, June 6-7; (iii) The 7th Across-Strait Workshop on Shock/Vortex Interaction, Tamshui, Taiwan, June 23-24; (iv) International Conference on Progress in Fluid Dynamics and Simulation, Taipei, Taiwan, October 25-27; (v) 56th Annual Conference of the Society of Aeronautics and Astronautics (Taiwan), Tainan, Taiwan, November 14-15; (vi) Antony Jameson 80th Birthday Symposium, Mathematics, Computing and Design – Where Analysis and Creativity Combine, Stanford University, USA, November 20-21.
- 2015: (i) The 18th International Conference on Finite Elements in Flow Problems, Taipei, Taiwan, March 16-18; (ii) The Asia University, Taiwan, August 18; (iii) Hong Kong Academy of Engineering Sciences, Hong Kong, China, October 22.
- 2016: (i) The Society of Hong Kong Scholars, Hong Kong, China, January 18; (ii) Stanford University, USA, July 1; (iii) The 23rd National Computational Fluid Dynamics Conference, Kaohsiung, Taiwan, August 18; (iv) 2016 edX Global Forum, Paris, France, November 14-16.
- 2017: (i) King Abdullah University of Science and Technology, Thuwal, Saudi Arabia, January 10; (ii) Singapore University of Technology and Design, Singapore, February 10; (iii) The Open University of Hong Kong, Hong Kong, China, February 27; (iv) Open Innovations Forum, Moscow, Russia, October 17.

Recent Activities in Organizing Professional Conferences (as a member/chair of scientific/advising/organizing committee)

- 3rd International Conference on Computational Heat and Mass Transfer, Banff, Canada, May 05-09, 2003.
- 15th International Symposium on Transport Phenomena (ISTP-15) May 9-15, 2004 in Bangkok.
- International Conference on Thermal Engineering Theory and Applications, May 31-June 4, 2004, Beirut, Lebanon.
- 3rd International Symposium on Fluid Machinery and Fluid Engineering (ISFMFE) August 28-31, 2004, Beijing, China.
- 4th International Conference on Computational Heat and Mass Transfer, Paris, France, May 2005.
- 5th International Conference on Computational Heat and Mass Transfer, June 18-22, 2007, Canmore, Canada.
- MAV07, September 17-21, 2007, Toulouse, France.
- 2nd US-France Symposium of the International Center for Applied Computational Mechanics, May 28-30, 2008, Rocamadour, France.
- 6th International Conference on Computational Fluid Dynamics in the Oil & Gas, Metallurgical and Process Industries 10-12 June 2008 Trondheim, Norway.
- EMAV (The European Micro Aerial Vehicle Conference and Flight Competition), September 14-17, 2009, Delft, The Netherlands.
- Seventh International Conference on Computational Physics (ICCP7) May 2010, Beijing, China.
- Asian Aerospace Expo and Congress, March 2011, Hong Kong.
- The 6th International Conference on Fluid Mechanics, June 30 to July 3, 2011, Guangzhou, China.
- The International Micro Air Vehicle (IMAV) conference and flight competitions, September 12-15, 2011, The Netherlands.
- The 26th IAHR Symposium on Hydraulic Machinery and Systems, Beijing, Aug. 19-23, 2012.
- The 5th ISFMFE (International Symposium on Fluid Machinery and Fluids Engineering), Oct. 24-27, 2012, Jeju island, Korea.
- 4th Annual International Conference in Computational Surgery, The Joseph Martin Conference Center at Harvard Medical School, Boston, MA, December 9-10-11, 2012.
- The 4th Asian Symposium on Computational Heat Transfer and Fluid Flow (ASCHT), Hong Kong University of Science & Technology, Hong Kong, June 3-6, 2013.

- 2014 International Micro Air Vehicle Conference and Competition (IMAV 2014), August 12-15, 2014 Delft, The Netherlands.
- International Symposium of Cavitation and Multiphase Flow (ISCM 2014), Tsinghua University, Beijing, China, October 18-21, 2014.
- 6th International Symposium on Advances in Computational Heat Transfer, Rutgers University, New Jersey, USA, in May 2015.

Editorship

- *Cambridge University Press: Cambridge Aerospace Book Series*: General Editor (2000-present)
- *ASME Applied Mechanics Reviews*: Associate Editor (2002-2010)
- *Computer Modeling in Engineering & Sciences*: Associate Editor (2002-2004)
- *Acta Mechanica Sinica*: Associate Editor (2004-2007); Co-Editor-in-Chief (2008-present)
- *Encyclopedia of Aerospace Engineering*: Co-Editor-in-Chief (2007-present)
- *Communications in Computational Physics*: Associate Editor (2009-present)
- *Annals of Mathematical Sciences and Applications*: Associate Editor (2015-present)

Member of Editorial Boards

- *AIAA Journal*
- *Progress in Aerospace Sciences*
- *Numerical Heat Transfer: An International Journal of Computation and Methodology (Part A: Applications, Part B: Fundamentals)*
- *Progress in Computational Fluid Dynamics: An International Journal*
- *International Journal for Numerical Methods in Heat and Fluid Flow*
- *International Journal for Numerical Methods in Fluids*
- *Chinese Journal of Aeronautics*
- *Transactions of the Aeronautical and Astronautical Society of the Republic of China (Taiwan)*
- *Frontiers of Energy and Power Engineering in China*
- *International Journal of Fluid Machinery and Systems*
- *Journal of Computational Surgery*

Professional Societies

Fellow: American Institute of Aeronautics and Astronautics (AIAA), American Society of Mechanical Engineers (ASME)

Member: American Physical Society (APS), The Combustion Institute, Sigma Xi (The Scientific Research Society).

Selected Summary of Professional and Public Services

- NASA Consortium of Computational Fluid Dynamics for Propulsion Design (1990-1994)
- ASME Heat Transfer Division, Aerospace Heat Transfer (K-12) Committee (1994-2000)
- National Science Foundation (Committee of Visitors, 1997)
- Director of NASA Florida Space Grant Consortium (1998-2000)
- University of Florida Presidential Search Advisory Committee (1999)
- APS Fluid Dynamics Prize Selection Committee (Vice Chair, 1999-2000; Chair, 2000-2001)
- AIAA Pendray Literature Award Selection Committee (2003-2008)
- Universities Space Research Association (USRA) International Working Group (2003-2004)
- Air Force Research Laboratory- Air Vehicles Directory Awards Selection Committee (2005)
- University of Michigan College of Engineering Dean's Search Advisory Committee (2005)
- Referee of the State Natural Science Award of the People's Republic of China (2006)

- Panelist of National Research Council's Space Studies Board: Committee on Meeting the Workforce Needs for the National Vision for Space Exploration (2006)
- University of Michigan Department of Mechanical Engineering Chair Search Advisory Committee (2007)
- External Advisory Committee of Department of Aeronautics and Astronautics, University of Washington (2007-present)
- Naval Research Laboratory External Review Panelist of Materials and Chemistry Technology S&T Program (2008)
- School of aerospace Engineering, Technical University of Delft: International Peer Review Committee (2008)
- Department of Mechanical Engineering Academic Advisory Committee, Hong Kong University of Science and Technology (2009 - 2010)
- Department of Aerospace Engineering, Korea Advanced Institute of Science and Technology: Global Advisory Board (2011, 2016)
- Member of Higher Education Evaluation and Accreditation Council of Taiwan, for National Taiwan University (December 2011)
- Member of Board of Directors, Hong Kong Science and Technology Parks Corporation (July 2012 - present)
- Member of University Grants Committee (Hong Kong) (January 2014 – January 2018)
- Member of Board of Governors of Technion, Israel Institute of Technology (June 2015 - present)
- Member of Visiting Committee, Department of Aeronautics and Astronautics, University of Washington (2015 – present)
- Member of University Advisory Board, Coursera (2013-2016)

Faculty Tenure/Promotion/Appointment Reviewer

Brown University, Cornell University, Georgia Institute of Technology, Hong Kong University of Science and Technology, Iowa State University, Mississippi State University, National Tsing Hua University (Taiwan), Ohio State University, Pennsylvania State University, Princeton University, Purdue University, Rutgers University, Stanford University, Technion, Tel-Aviv University, Texas A&M University, University of California (Irvine, Davis, Santa Barbara), University of Cambridge, University of Central Florida, University of Colorado, University of Florida, University of Iowa, University of Maryland, University of Massachusetts, University of Miami (Florida), University of Notre Dame, University of Tennessee, University of Toronto, University of Virginia, University of Washington, Vanderbilt University.

Patent

Shyy, W., Francois, M., and Chung, J. N., 2003, U.S. Patent No. 6,598,409: Thermal Management Device.

PUBLICATIONS

Books Authored

1. Shyy, W. (author), *Computational Modeling for Fluid Flow and Interfacial Transport*, Elsevier, Amsterdam, The Netherlands, (1994, revised printing 1997); Dover, New York, (2006) xviii + 504 pages. {Reviews of this book: W.B.J. Zimmerman, *The Chemical Engineering Journal*, Vol. 55, (1994); P.L. Roe, *AIAA Journal*, Vol. 32, (1994); B. Huang, *Drying Technology*, Vol. 12, (1994); L.A. Bertram, *Applied Mechanics Reviews*, Vol. 48, (1995); A. Iserles, *Journal of Fluid Mechanics*, Vol 305, (1995); H. Muthsam, *Monatshefte fur Mathematik* (1996)}□
2. Shyy, W., Udaykumar, H.S., Rao, M.M., and Smith, R.W. (authors), *Computational Fluid Dynamics with Moving Boundaries*, Taylor & Francis, Washington, DC, (1996, revised printing

- 1997, 1998 & 2001); Dover, New York, (2007), xviii + 285 pages {Reviews of this book: S. Bhaduri, *Applied Mechanics Reviews*, Vol. 50, (1997); D. Kothe, *AIAA Journal*, Vol. 36 (1998)}.
3. Shyy, W., Thakur, S.S., Ouyang, H., Liu, J., and Blosch, E. (authors), *Computational Techniques for Complex Transport Phenomena*, Cambridge University Press, New York, hardcover (1997), paperback (2005), xviii + 321 pages. {Review of this book : W.M. Worek, *Applied Mechanics Reviews*, Vol. 52, (1999); *Mathematics Abstract*, April (1999); *AIChE J.*}
 4. Shyy, W., Lian, Y., Tang, J., Viieru, D., and Liu, H. (authors), *Aerodynamics of Low Reynolds Number Flyers*, Cambridge University Press, New York, (2008, 2009, 2011; paperback 2011). {Review of this book: M. Platzer, *AIAA Journal*, Vol. 47, (2009)}.
 5. Shyy, W. (author), *Flight InSight: A Collection of Natural Flyer Photographs*, self-publishing, (2010); second edition (2011); third edition (2015), fourth edition (2016).
 6. Shyy, W., Aono, H., Kang, C.-K., and Liu, H. (authors), *An Introduction to Flapping Wing Aerodynamics*, Cambridge University Press, New York (2013).

Books/Proceedings/Special Issues Edited

1. Chao, C. C., Orszag, S. A., and Shyy, W. (editors): *Recent Advances in Computational Fluid Dynamics*, Lecture Notes in Engineering, Vol. 43, Springer-Verlag, New York, (1989) vi + 529 pages.
2. Atreya, A., Gritzo, L., Saltiel, C., and Shyy, W. (editors): *Fire and Combustion System*, Volume 2 of the Proceedings of the Heat Transfer Division, 1995 ASME International Mechanical Engineering and Exposition, HTD-Vol. 317-2, New York, (1995), pp. 1-212.
3. Shyy, W., and Narayanan, R. (editors): *Fluid Dynamics at Interface*, Cambridge University Press, (1999), paperback (2010), xvi + 461 pages.
4. Shyy, W. (editor): *Applied Mechanics Reviews - Special Issue on Animal Locomotion in Fluids, and Its Mimicry*, July (2005).
5. Abate, G., Ol, M., and Shyy, W. (editors): Special Section on *Biologically Inspired Aerodynamics*, *AIAA Journal*, Vol. 46, (2008), pp. 2113-2190.
6. Blockley, R., and Shyy, W. (editors-in-chief): *Encyclopedia of Aerospace Engineering*, printed version published by Wiley-Blackwell in November 2010, 9 volumes, 5648 pages; online version updated annually.

Research & Review Articles in Journals/Books

1. Shyy, W., and Adamson, T.C., Jr., "Analysis of Hydrocarbon Emissions from Conventional Spark-Ignition Engines," *Combustion Science and Technology*, Vol. 33, (1983), pp. 245-260.
2. Shyy, W., "Determination of Relaxation Factors for High Cell Peclet Number Flow Simulation," *Computer Methods in Applied Mechanics and Engineering*, Vol. 43, (1984), pp. 221-230.
3. Shyy, W., "A Study of Finite Difference Approximations to Steady-State, Convection-Dominated Flow Problems," *Journal of Computational Physics*, Vol. 57, (1985), pp. 415-438.
4. Shyy, W., Tong, S.S., and Correa, S.M., "Numerical Recirculating Flow Calculation Using a Body-fitted Coordinate System," *Numerical Heat Transfer*, Vol. 8, (1985), pp. 99-113.
5. Shyy, W., "A Numerical Study of Annular Dump Diffuser Flows," *Computer Methods in Applied Mechanics and Engineering*, Vol. 53, (1985), pp. 47-65.
6. Shyy, W., "Numerical Outflow Boundary Condition for Navier-Stokes Flow Calculations by a Line Iterative Method," *AIAA Journal*, Vol. 23, (1985), pp. 1847-1848.
7. Correa, S.M., Drake, M. C., Pitz, R. W., and Shyy, W., "Prediction and Measurement of Non-Equilibrium Turbulent Diffusion Flame," *Twentieth Symposium (International) on Combustion*, The Combustion Institute, Pittsburgh, PA, (1985), pp. 337-343.
8. Braaten, M. E., and Shyy, W., "A Study of Recirculating Flow Computation Using Body-fitted Coordinates: Consistency Aspects and Mesh Skewness," *Numerical Heat Transfer*, Vol. 9, (1986), pp. 559-574.

9. Braaten, M. E., and Shyy, W., "Comparison of Iterative and Direct Solution Methods for Viscous Flow Calculations in Body-fitted Coordinates," *International Journal for Numerical Methods in Fluids*, Vol. 6, (1986), pp. 325-349.
10. Drake, M. C., Pitz, R. W., and Shyy, W., "Conserved Scalar Probability Density Functions in a Turbulent Jet Diffusion Flame," *Journal of Fluid Mechanics*, Vol. 171, (1986), pp. 24-51.
11. Shyy, W., and Vu, T.C., "A Numerical Study of Incompressible Navier-Stokes Flow through Rectilinear and Radial Cascade of Turbine Blades," *Computational Mechanics*, Vol. 1, (1986), pp. 269-279.
12. Shyy, W., and Braaten, M. E., "Three-Dimensional Analysis of the Flow in a Hydraulic Turbine Draft Tube," *International Journal for Numerical Methods in Fluids*, Vol. 6, (1986), pp. 861-882.
13. Shyy, W., "A General Coordinate System Method for Computing Transport Phenomena," *Heat Transfer 1986*, (C. L. Tien, V. P. Carey and J. K. Ferrell (eds.)), Hemisphere, Washington, D.C., Vol.2, (1986), pp. 397-402.
14. Shyy, W., "An Adaptive Grid Method for Navier-Stokes Flow Computation," *Applied Mathematics and Computation*, Vol. 21, (1987), pp. 201-219.
15. Shyy, W., "An Adaptive Grid Method for Navier-Stokes Flow Computation II: Grid Addition," *Applied Numerical Mathematics*, Vol. 2, (1986), pp. 9-19.
16. Shyy, W., "Effects of Open Boundary on Incompressible Navier-Stokes Flow Computation: Numerical Experiments," *Numerical Heat Transfer*, Vol. 12, (1987), pp. 157-178.
17. Correa, S. M., and Shyy, W., "Computational Models and Methods for Continuous Gaseous Turbulent Combustion," *Progress in Energy and Combustion Science*, Vol. 13, (1987), pp. 249-292.
18. Drake, M. C., Correa, S. M., Pitz, R. W., Shyy, W., and Fenimore, C. P., "Superequilibrium and Thermal Nitric Oxide Formulation in Turbulent Diffusion Flames," *Combustion and Flame*, Vol. 69, (1987), pp. 347-365.
19. Shyy, W., Braaten, M. E., and Sober, J. S., "A Three-Dimensional Grid Generation Procedure for Gas Turbine Combustor Flow Computations," *Journal of the CSME*, Vol. 8, (1987), pp. 1-9; also AIAA Paper No. 87-2024, *AIAA 25th Aerospace Sciences Meeting*, January 12-15, Reno, NV.
20. Braaten, M. E., and Shyy, W., "A Study of Pressure Correction Methods with Multigrid for Viscous Flow Calculations in Non-Orthogonal Curvilinear Coordinates," *Numerical Heat Transfer*, Vol. 11, (1987), pp. 417-442.
21. Shyy, W., "Adaptive Computation, Grid Smoothness and Numerical Boundary Treatment for Recirculating Navier-Stokes Flows," *Journal of the CSME*, Vol. 8, (1987), pp. 139-154.
22. Shyy, W., Tswei, Y-M., and Lee, D., "A Study of Lagrangian Models for Calculating Dilute Particle Flow, Part 1: Basics," *Transactions of AARC*, Vol. 20, (1987), pp. 83-98.
23. Vu, T. C., and Shyy, W., "Navier-Stokes Computation of Radial Inflow Turbine Distributor," *ASME Journal of Fluids Engineering*, Vol. 110, (1988), pp. 29-32.
24. Shyy, W., and Dakin, J.T., "Three-Dimensional Natural Convection in a High-Pressure Mercury Discharge Lamp," *International Communications in Heat and Mass Transfer*, Vol. 15, (1988), pp. 51-58.
25. Shyy, W., "Computation of Complex Fluid Flows Using Adaptive Grid Method," *International Journal for Numerical Methods in Fluids*, Vol. 8, (1988), pp. 475-489.
26. Shyy, W., Correa, S. M., and Braaten, M. E., "Computation of Flow in a Gas Turbine Combustor," *Combustion Science and Technology*, Vol. 58, (1988), pp. 97-117; earlier version entitled, "Computational Models for Gas-Turbine Combustors," published in R.M.C. So, J. H. Whitelaw and H. C. Mongia (eds.), *Calculations of Turbulent Reactive Flows*, ASME, New York (1986), pp. 141-184.
27. Shyy, W., "A Numerical Study of Two-Dimensional Compressible Navier-Stokes Flows," *Numerical Heat Transfer*, Vol. 14, (1988), pp. 323-341.

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29. Dakin, J. T., and Shyy, W., "The Prediction of Convection and Additive Demixing in Vertical Metal Halide Discharge Lamps," *Journal of the Electrochemical Society*, Vol. 136, (1989), pp. 1210-1215.
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31. Chang, P. Y., Shyy, W., and Dakin, J. T., "A Study of Three-Dimensional Natural Convection in High Pressure Mercury Lamps, Part I: Parametric Variations with Horizontal Mounting," *International Journal of Heat and Mass Transfer*, Vol. 33, (1990), pp. 483-493.
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34. Vu, T. C., and Shyy, W., "Navier-Stokes Flow Analysis for Hydraulic Turbine Draft Tubes," *ASME Journal of Fluids Engineering*, Vol. 112, (1990), pp. 199-204.
35. Shyy, W., and Chang, P. Y., "Effects of Convection and Electric Field on Thermofluid Transport in Horizontal High Pressure Mercury Arcs," *Journal of Applied Physics*, Vol. 67, (1990), pp. 1712-1719.
36. Shyy, W., and Chen, M.-H., "Steady-State Natural Convection with Phase Change," *International Journal of Heat and Mass Transfer*, Vol. 33, (1990), pp. 2545-2563.
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38. Shyy, W., and Vu, T. C., "On the Adoption of Velocity Variable and Grid System for Fluid Flow Computation in Curvilinear Coordinates," *Journal of Computational Physics*, Vol. 92, (1991), pp. 82-105.
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41. Shyy, W., and Chen, M.-H., "Interaction of Thermocapillary and Natural Convection Flows during Solidification: Normal and Reduced Gravity Conditions," *Journal of Crystal Growth*, Vol. 108, (1991), pp. 247-261.
42. Shyy, W., "Structure of an Adaptive Grid Computational Method from the Viewpoint of Dynamic Chaos," *Applied Numerical Mathematics*, Vol. 7, (1991), pp. 263-285.
43. Shyy, W., "Structure of an Adaptive Grid Computational Method from the Viewpoint of Dynamic Chaos, Part II: Grid Addition and Probability Distribution," *Applied Numerical Mathematics*, Vol. 7, (1991), pp. 523-545.
44. Chang, P.Y., and Shyy, W., "Three-Dimensional Heat Transfer and Fluid Flow in the Modern Discharge Lamp," *International Journal of Heat and Mass Transfer*, Vol. 34, (1991), pp. 1811-1822.
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56. Gingrich, W.K., Cho, Y.I., and Shyy, W., "Effect of Shear Thinning on Laminar Heat Transfer Behavior in a Rectangular Duct," *International Journal of Heat and Mass Transfer*, Vol. 35, (1992), pp. 2823-2836.
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