

# LIN, CHING-LONG

## 林慶龍

---

Professor  
The University of Iowa  
Department of Mechanical and Industrial Engineering  
Iowa City, Iowa 52242-1527  
Phone: 319-335-5673  
Fax: 319-335-5669  
[ching-long-lin@uiowa.edu](mailto:ching-long-lin@uiowa.edu)  
<http://www.engineering.uiowa.edu/~ching>

### EDUCATION

1994 Ph.D., Department of Mechanical Engineering, Stanford University  
1989 M.S., Department of Mechanical Engineering, Stanford University  
1986 B.S., Department of Mechanical Engineering, National Taiwan University

### EMPLOYMENT

2007 Professor, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, Iowa  
2003-2007 Associate Professor, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, Iowa  
1997-2003 Assistant Professor, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, Iowa  
1996-1996 Research Coordinator, Colorado State University, Fort Collins, Colorado  
1994-1996 Visiting Scientist, National Center for Atmospheric Research, Boulder, Colorado

### RESEARCH AREAS

General areas: biofluids, computational methods and parallel computing, turbulent flows  
Current highlights: multi-scale simulation of a breathing lung, cell-scale to macro-scale integration, fluid-structure interaction, image registration, GPU computing

### HONORS AND AWARDS

2010 Invited Contributor, *Comprehensive Physiology*, the landmark series *Handbook of Physiology*, Wiley-Blackwell  
2010 Career Development Award, The University of Iowa  
2008 Keynote Lecture, Symposium on Natural & Artificial Respiration, Aachen, Germany  
2008 Feature Speaker, American Thoracic Society, Toronto, Canada  
2004 Career Development Award, The University of Iowa  
1999 National Science Foundation CAREER Award  
1997 Old Gold Summer Fellowship, The University of Iowa  
1988 Rotary International Scholarship  
1986 Phi Tau Phi Scholastic Honor Society Member  
1982-1986 Four-time Recipient of Book Coupon Award, National Taiwan University, for being in top five percent of about 137 students (ranked first twice)

## SELECTED PUBLICATIONS (for a complete list, refer to Lin's website, 11/25/2010)

Note: peer-reviewed journal articles, 58; citation, 640+; h-index, 14; based on ResearcherID

1. Yin, Y., E.A. Hoffman, K. Ding, J. M. Reinhardt, and **C.-L. Lin**, "A cubic B-spline-based hybrid registration of lung CT images for a dynamic airway geometric model with large deformation," *Physics in Medicine and Biology* (impact factor 2.781), 56:203-218, **2011**.
2. Lambert, R. A., P. T. O'Shaughnessy, M. H. Tawhai, E. A. Hoffman, and **C.-L. Lin**, "Regional deposition of particles in an image-based airway model: large-eddy simulation and left-right lung ventilation asymmetry," *Aerosol Science & Technology* (2.739), 45:11-25, **2011**.
3. Tawhai, M. H. and **C.-L. Lin**, "Image-based modeling of lung structure and function," *J. Magnetic Resonance Imaging* (2.770), 32(6): 1421-1431, **2010**.
4. Choi, J., G. Xia, M. H. Tawhai, E. A. Hoffman, and **C.-L. Lin**, "Numerical study of high frequency oscillatory air flow and convective mixing in a CT-based human airway model," *Annals of Biomedical Engineering* (2.409), 38(12): 3550-3571, **2010**.
5. Yin, Y., J. Choi, E. A. Hoffman, M. H. Tawhai, and **C.-L. Lin**, "Simulation of pulmonary air flow with a subject-specific boundary condition," *J. Biomechanics* (2.657), 43(11):2159-2163, **2010**.
6. Xia, G., M. H. Tawhai, E. A. Hoffman, and **C.-L. Lin**, "Airway Wall Stiffness and Peak Wall Shear Stress: A Fluid-Structure Interaction Study in Rigid and Compliant Airways," *Annals of Biomedical Engineering* (2.409), 38(5): 1836-1853, **2010**.
7. **Lin, C.-L.**, M. H. Tawhai, G. McLennan, E.A. Hoffman, "Multiscale Simulation of Gas Flow in Subject-Specific Models of the Human Lung," *IEEE Eng. in Med. Biol.* (1.081), 28(3): 25-33, **2009**.
8. Choi, J., M.H. Tawhai, E.A. Hoffman, and **C.-L. Lin**, "On intra- and inter-subject variabilities of airflow in the human lungs," *Phys. Fluids* (1.638), 21, 101901, **2009**.
9. Yin, Y., E. A. Hoffman, and **C.-L. Lin**, "Mass preserving non-rigid registration of CT lung images using cubic B-spline," *Medical Physics* (2.704), 36(9): 4213-4222, **2009**.
10. Tawhai, M. H., M. P. Nash, **C.-L. Lin**, and E. A. Hoffman, "The influence of supine and prone posture on regional lung density & pleural pressure gradients in the human lung", *J. Appl. Physiol.* (3.732), 107: 912-920, **2009**.
11. Kumar, H., M. H. Tawhai, E.A. Hoffman, and **C.-L. Lin**, "The effects of geometry on airflow in the acinar region of the human lung," *J. Biomechanics* (2.657), 42(11): 1635-1642, **2009**.
12. Xia, G. and **C.-L. Lin**, "An Unstructured Finite Volume Approach for Structural Dynamics in Response to Fluid Motions," *Computers & Structures* (1.440), 86: 684-701, **2008**.
13. Jeong, N., D. H. Choi, and **C.-L. Lin**, "Estimation of thermal and mass diffusivity in a porous medium of complex structure using a lattice Boltzmann method," *Int. J. Heat and Mass Transfer* (1.947), 51: 3913-3923, **2008**.
14. **Lin, C.-L.**, M. H. Tawhai, G. McLennan, and E.A. Hoffman, "Characteristics of the turbulent laryngeal jet and its effect on airflow in the human intra-thoracic airways," *Respiratory Physiology & Neurobiology* (2.135), 157: 295-309, **2007**.
15. Kabilan, S., **C.-L. Lin**, and E. A. Hoffman, "Characteristics of Airflow in a CT-based Ovine Lung: A Numerical Study," *J. Appl. Physiol.* (3.732), 102: 1469-1482, **2007**.
16. Jeong, N., D. H. Choi, and **C.-L. Lin**, "Prediction of Darcy-Forchheimer drag for micro-porous structures of complex geometry using Lattice-Boltzmann method," *J. Micromechanics and Microengineering* (1.997), 16: 2240-2250, **2006**.
17. Lee, T., **C.-L. Lin**, and L. D. Chen, "A Lattice Boltzmann Algorithm for the Laminar Jet Diffusion Flame," *J. Computational Physics* (2.369), 215: 133-152, **2006**.

18. **Lin, C.-L.**, H. Lee, T. Lee, and L. Weber, “A Level Set Characteristic Galerkin Finite Element Method for Free Surface Flows,” *Int. J. Numerical Methods in Fluids* (0.936), 49 (5): 521-547, **2005**.
19. Lee, T. and **C.-L. Lin**, “Rarefaction and compressibility effects of the lattice Boltzmann equation method in a gas microchannel,” *Physical Review E* (2.400), E 71, 046706: 1-10, **2005**.
20. Lee, T. and **C.-L. Lin**, “A stable discretization of the lattice Boltzmann equation for simulation of incompressible two-phase flows at high density ratio,” *J. Computational Physics*, 206: 16-47, **2005**.
21. Yue, W., **C.-L. Lin**, and V. C. Patel, “Large Eddy Simulation of Turbulent Open-Channel Flows With Free-Surface Simulated By Level Set Method,” *Phys. Fluids*, 17, 025108:1-12, **2005**.
22. Cui, J., V.C. Patel, and **C.-L. Lin**, “Large-Eddy Simulation of Turbulent Flow in a Channel with Rib Roughness,” *Int. J. Heat and Fluid Flow* (1.498), 24: 372-388, **2003**.
23. Lee, T. and **C.-L. Lin**, “A Pressure Evolution Lattice Boltzmann Equation Method for Two-Phase Flow with Phase Change,” *Physical Review E*, 67, 056703:1-10, **2003**.
24. Lee, T. and **C.-L. Lin**, “An Eulerian Description of the Streaming Process in the Lattice Boltzmann Equation,” *J. Computational Physics*, 185: 445-471, **2003**.
25. Lee, T. and **C.-L. Lin**, “A Characteristic Galerkin Method for Discrete Boltzmann Equation,” *J. Computational Physics*, 171: 336-356, **2001**.
26. **Lin, C.-L.** and Y.G. Lai, “Lattice Boltzmann method on composite grids,” *Physical Review E* (2.400), 62 (2): 2219-2225, **2000**.
27. **Lin, C.-L.**, Q. Xia, and R. Calhoun, “Retrieval of Urban Boundary Layer Structures from Doppler Lidar Data. Part II: Proper Orthogonal Decomposition,” *J. Atmos. Sci.* (2.911), 65(1): 21-42, **2008**.
28. **Lin, C.-L.**, T. Chai, and J. Sun, “On Smoothness Constraints for Four-Dimensional Data Assimilation,” *J. Computational Physics* (2.369), 181: 430-453, **2002**.
29. **Lin, C.-L.**, Chai, T., and J. Sun, “Retrieval of Flow Structures in a Convective Boundary Layer Using an Adjoint Model: Identical Twin Experiments,” *J. Atmos. Sci.*, 58 (13): 1767-1783, **2001**.
30. **Lin, C.-L.**, “Local pressure-transport structure in a convective atmospheric boundary layer,” *Phys. Fluids* (1.638), 12 (5): 1112-1128, **2000**.
31. **Lin, C.-L.**, “Near-grid energy transfer and coherent structures in the convective planetary boundary layer,” *Phys. Fluids*, 11 (11): 3482-3494, **1999**.
32. **Lin, C.-L.**, Moeng, C.-H., Sullivan, P.P., J.C. McWilliams, “The effect of surface roughness on flow structures in a neutrally stratified planetary boundary layer,” *Phys. Fluids*, 9(11): 3235-3249, **1997**.
33. **Lin, C.-L.**, McWilliams, J.C., Moeng, C.-H., and P.P. Sullivan, “Coherent structures and dynamics in a neutrally stratified planetary boundary layer flow,” *Phys. Fluids*, 8 (10): 2626-2639, **1996**.

## FUNDING

**Note: as principal investigator, Lin has been awarded a total of ~\$3.2 millions funding since 2005.**

**Some major projects as principal investigator are:**

1. NIH: Multiscale Interaction of Pulmonary Gas Flow and Lung Tissue Mechanics
2. NIH: Large-Scale Computing and Visualization for Cardiopulmonary Imaging
3. NIH: Multiscale Simulation of Gas Flow Distribution in the Human Lung
4. NSF: Data Assimilation of Dual Doppler Lidar Observations of the Urban Boundary Layer
5. NSF CAREER: *A Priori* Test of Retrieval of Coherent Structures in the Atmospheric Boundary Layer using an Adjoint Model
6. ONR: Large Eddy Simulation of Ocean Boundary Layer Entrainment

## TEACHING

1. 059:009 Engineering Fundamentals III: Thermodynamics
2. 057:020 Fluid Mechanics
3. 058:040 Thermodynamics II
4. 058:143 Computational Fluid and Thermal Engineering
5. 058:268 Turbulent Flows
6. 058:269 [Computational Fluid Dynamics & Heat Transfer](#)
7. 058:091 Professional Seminar Mechanical Engineering
8. 058:191 Graduate Seminar Mechanical Engineering

## SUPERVISION

Completion: 7 PhD students, 3 MS students, 6 undergraduate students, 5 postdoctoral associates, 2 visiting scholars

Ongoing: 7 PhD students, 1 PhD student who will join the group in January 2011

Group alumni in academia:

1. Yongguan Cheng, professor, Wuhan University, China
2. Seok-Ki Choi, researcher, Korea Atomic Research Institute, Korea
3. Haegyun Lee, lecturer, Dankook University, Korea
4. Gökhan Kirkil, research scientist, Lawrence Livermore National Laboratory, U.S.A.
5. Taehun Lee, assistant professor, City College of New York, U.S.A.
6. Tianfeng Chai, scientific data analyst, STC, Washington D.C., U.S.A.
7. Jie Cui, associate professor, Tennessee Tech University, U.S.A.

## INVITED WORKSHOP/CONFERENCE SPEAKER/ATTENDEE

1. *Speaker:* Workshop “Imaging-based Physiome Models for Quantitative Analysis of the Lung and Other Organ Systems,” SPIE Medical Imaging, CA, February, 2010
2. *Speaker:* 6th World Congress on Biomechanics, Singapore, August 1-6, 2010
3. *Keynote Lecture:* 1<sup>st</sup> Symposium on Natural & Artificial Respiration, Aachen, Germany, July, 2008
4. *Feature Speaker:* American Thoracic Society International Conference, Toronto, Canada, May, 2008
5. *Attendee:* NSF Fluid Dynamics Community Workshop, Austin, Texas, March 22-23, 2010
6. *Attendee:* NSF Workshop on Cyber-Fluid Dynamics, NSF Headquarters, 2007
7. *Speaker:* NSF Mathematical Bioscience Institute Workshop on The Lung and the Respiratory - Structure, Oxygen Transport, Mathematical Bioscience Institute, The Ohio State University, November 7, 2006
8. *Speaker:* the 14th Int. Conference on Discrete Simulation of Fluid Dynamics in Complex Systems, Kyoto, Japan, August 22, 2005

## SEMINARS AND TALKS

1. Department of Aeronautics and Astronautics, National Cheng Kung University, Taiwan, 2010
2. National Center for High-Performance Computing, Taiwan, 2010
3. Institute of Applied Mechanics, National Taiwan University, Taiwan, 2010
4. Aerospace Engineering Seminar, Iowa State University, March 9, 2010
5. Mechanical and Aerospace Engineering Seminar, Arizona State University, 2009
6. Electrical and Computer Engineering Graduate Seminar, University of Iowa, 2009
7. ICTS Pilot Grant presentation, University of Iowa, 2009
8. The Cystic Fibrosis Research Conference, University of Iowa, 2008
9. MIE Graduate Seminar, University of Iowa 2007
10. MSM Consortium, NIH campus, 2007

11. Carleton Life Support Systems, Inc., Davenport, Iowa, 2006
12. Applied Mathematical and Computational Sciences Seminar, University of Iowa, 2006
13. Institute of Biomedical Engineering, National Cheng Kung University, Tainan, Taiwan, 2005
14. Academia Sinica, Taipei, Taiwan, 2005
15. National Center for High Performance Computing, Hsinchu, Taiwan, 2005
16. Korea Advanced Institute of Science and Technology, ME Graduate Seminar, Daejeon, Korea, 2005.
17. BME Graduate Seminar, University of Iowa, 2005
18. CEE Graduate Seminar, University of California, Los Angeles, 2005
19. ME Graduate Seminar, Arizona State University, 2004
20. Joint ME/IIHR Graduate Seminar, University of Iowa, 2004
21. Department of Physics & Astronomy, University of Iowa, 2003
22. IIHR Seminar, University of Iowa, 2002.
23. Department of Theoretical & Applied Mechanics, University of Illinois at Urbana-Champaign, 2000
24. Forecast Systems Laboratory, National Oceanic and Atmospheric Administration, 2000
25. National Center for Atmospheric Research, 2000
26. ME/IIHR Graduate Seminar, University of Iowa, 2000
27. Department of Mathematics, University of Iowa, 1999
28. ME/IIHR Graduate Seminar, University of Iowa, 1997

## INTERVIEWS AND FEATURE ARTICLES

1. [The Physiome: A Mission Imperative](#), [Biomedical Computation Review](#), a magazine published by Simbios, March 24, 2010
2. Feature Story: [Virtual Breath](#), Texas Advanced Computing Center, March 2009
3. [Spotlight Iowa City: Fluid dynamics and the human lung](#), Daily Iowan, April, 2010
4. [Profile in Translation](#), Institute for Clinical and Translational Science, NIH CTSA Consortium, 2010

## MEMBERSHIP OF PROFESSIONAL SOCIETY

1. American Society of Mechanical Engineering (ASME)
2. American Physical Society (APS)
3. American Physiological Society (APS)
4. IMAG Multi-Scale Modeling Consortium (MSM)
5. Biomedical Engineering Society (BMES)
6. American Society for Engineering Education (ASEE)

## SERVICES

### National and International

1. [Editorial Board](#), *Int. J. of Computational Medicine & Healthcare*, 2010-present
2. [Reviewer](#)
  - (1) *Ad hoc member*: NIH *Respiratory Integrative Biology and Translational Research* (RIBTR) Study Section (once), NIH *Modeling and Analysis of Biological Systems* (MABS) Study Section (twice)
  - (2) *Reviewer*: National Science Foundation, United Kingdom Medical Research Council, Ireland Health Research Board, Research Grants Council of Hong Kong, Army Research Office, and 30+ journals, such as *Journal of Fluid Mechanics*, *Physics of Fluids*, *Journal of Computational Physics*, *Journal of Applied Physiology*, *Annals of Biomedical Engineering*, *Journal of Biomechanics*, *Aerosol Science & Technology*, and among others.
  - (3) *External Reviewer*: Promotion and Tenure Evaluation (twice)
  - (4) *External Examiner*: Ph.D. dissertation (once)

### 3. Committee, Working Group Lead, Conference Chair and Organizer

#### *Atmospheric Boundary Layer:*

- (1) *Elected Member:* Boundary Layers and Turbulence Committee, American Meteorological Society (AMS), 01/2003-01/2006
- (2) *Symposium Co-Chair:* AMS 17th Symposium on Boundary Layers and Turbulence, San Diego, CA, 22-25 May, 2006
- (3) *Session Co-Chair:* “Remote Sensing and Data Assimilation”, AMS 17th Symposium on Boundary Layers and Turbulence, San Diego, CA, 22-25 May, 2006

#### *Biomedical Engineering:*

- (1) *Lead:* Working Group “Cell-to-Macroscale”, Interagency Modeling and Analysis Group (IMAG) & the Multi-scale Modeling (MSM) Consortium, 2010-present
- (2) *Lead Author and Organizer:* “Cell Scale to Macroscale Integration” white paper and working group discussion, Annual Multi-scale Modeling (MSM) Consortium meeting, Rockville, Maryland, October 27-28, 2010
- (3) *Local Organizing Committee Member:* International Summit on The Future of Quantitative and Functional Lung Imaging, October 2-4, Iowa City, Iowa, 2008
- (4) *Session Chair:* “Biofluids: Physiological Cardiovascular I”, 63rd Annual Meeting of the American Physical Society (APS) Division of Fluid Dynamics (DFD), Long Beach, California, November 21-23, 2010
- (5) *Session Chair and Organizer:* “Lung Computational Fluid Dynamics and Particle Deposition,” Biomedical Engineering Society (BMES) Annual Meeting, Austin, Texas, October 6-9, 2010
- (6) *Session Chair and Organizer:* “Respiratory Transport and Structure Interactions,” 16th US National Congress of Theoretical and Applied Mechanics, State College, PA, June 27-July, 2010
- (7) *Session Chair and Organizer:* Computational Modeling in the Respiratory System, Track: Respiratory Engineering, Annual Meeting of Biomedical Engineering Society (BMES), Pittsburgh, PA, October 7-10, 2009
- (8) *Session Chair and Organizer:* “CFD, Modeling, and Atlas”, International Summit on The Future of Quantitative and Functional Lung Imaging, October 2-4, Iowa City, Iowa, 2008

### **University, College, and Department**

#### 1. University

- (1) Graduate Council (by election), College of Graduate School, 2007-2010
- (2) Reviewer, Graduate College Mentor Award, 2010
- (3) Reviewer, Spriestersbach Dissertation Prize, 2008 & 2010

#### 2. College of Engineering

- (1) Chair, Information Technology Committee, 2006-2008
- (2) Faculty Perception of Administrators (FPOA) Committee, Review of IIHR Director, 2006-2007
- (3) Graduate Research Council, 2003-2004
- (4) FPOA Committee, Review of Departmental Executive Officer (DEO) of the Department of Mechanical and Industrial Engineering (MIE), 2003-2004

#### 3. Department

- (1) Chair of MIE Awards Committee, 2010-present
- (2) Chair of ME Undergraduate Committee, 2009-2010
- (3) Chair of ME Graduate Committee, 2006-2007
- (4) Chair of ME Ph.D. Qualifying Exam Committee, 2002-2003, 2006-2007
- (5) Chair of ABET Thermal/Fluid Group, 2003
- (6) Chair of IIHR Computer Committee, 2001-2003
- (7) Member of MIE Strategic Planning Committee, 2005-2007, 2009-2010
- (8) Member of IIHR Strategic Planning Committee, 2009-2010
- (9) Member of ABET ME Program Committee, 2007-2008

- (10) Member of ME Undergraduate Committee, 1998-2001, 2007-2010
- (11) Member of ME Graduate Committee, 2002-2004, 2006-2007
- (12) Member of ME Faculty Search Committee, 1998, 2006
- (13) Member of MIE Self-Study Committee, 2003-2004
- (14) Member of MIE Peer-Observation-of-Teaching Committee, 2003-present
- (15) Member of MIE Consulting Group Committee for Promotion and Tenure, 2003-present
- (16) Member of ME Ph.D. Qualifying Exam Committee, 2003-2004
- (17) Secretary, ABET Thermal/Fluid Group, 2001
- (18) Secretary, ME Faculty, 1997-1998

4. Other Student Services

- (1) Judge, University of Iowa College of Engineering Research Open House (twice)
- (2) Judge, University of Iowa James F. Jakobsen Graduate Conference (once)
- (3) Instructor, Review of Thermodynamics for Fundamentals of Engineering Examination (four times)