# Yuan-Nan Young

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49 Howard Court
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**Citizenship** Taiwan, United States Permanent Resident

**Employment**

Dept. of Mathematical Sciences, NJIT
Assistant Professor — Sep. 2004 - Current

Center for Turbulence Research, Stanford University
Postdoctoral Fellow — Sep. 2002 - Aug. 2004

Engineering Sciences and Applied Math, Northwestern University
Postdoctoral Fellow — Sep. 2000 - Aug. 2002

ASCI/FLASH Center, University of Chicago
Postdoctoral Research Associate — March-September, 2000

Department of Physics, National Taiwan University
Instructor — Sep. 1993 - Aug. 1994

**Education**

University of Chicago, Chicago, IL
Ph.D. in Astronomy and Astrophysics — March, 2000

University of Chicago, Chicago, IL
M.Sc. in Astronomy and Astrophysics — March, 1996
Enrolled in Fall, 1994. Ph.D. candidate in Fall, 1995 with GPA 3.9/4.0

National Taiwan University, Taipei, Taiwan
B.Sc. in Physics — June, 1993
Enrolled in Fall, 1989. GPA 3.7/4.0

**Fellowship and award**

Postdoctoral Fellowship
Center for Turbulence Research, Stanford University — Sep. 2002 - Aug. 2004

Lectureship
Engineering Sciences and Applied Mathematics, Northwestern University — Fall, 2001

Geophysical Fluid Dynamics Fellowship
GFD Summer Program, Wood Hole Oceanographic Institution — Summer, 1999

Book Awards for Top 5% Undergraduate Students
National Taiwan University 1990

**Program**

Visiting Staff - Geophysical Fluid Dynamics Summer Program, Woods Hole Oceanographic Institution June-July, 2002

Visiting Student - IGPP (Institute of Geophysical and Planetary Physics)
Lawrence Livermore National Lab July-October, 1998

Visiting Student - Geophysical Fluid Dynamics Summer Program
Woods Hole Oceanographic Institution June-July, 1998

Visiting Student - Physics Department
Academic Sinica, Taiwan June-August, 1992

**Research experience**

**Hybrid level set methods:** particle level set method, level set with VOF method, and application of level set methods to image processing and medical image segmentation
**Fluid dynamics:** multi-scale analysis, matched asymptotics, Floquet analysis and stability analysis, simulations of incompressible turbulent flows, particle level set method in multi-phase turbulent flow, sub-grid scale modeling in stratified turbulence, particle-laden turbulence
**Complex systems:** pattern formation and defect chaos, particle method for chaotic mixing

**Computing Experience**

• **Programming:** Fluent in C, Fortran 77, Fortran 90, MPI (Massage Passing Interface), IDL (Interactive Data Language), Maple, Mathematica and LaTeX.
• **Parallel Computing:** Experience with various high-performance parallel computers such as the 256-processor T3E Cray at PSC (Pittsburgh Supercomputing Center), SGI Origin 3000 and 2000 clusters at NASA/Ames, 98-processor SGI Origin 2000 at Argone National Labs and the 256-processor HP blue horizon at SDSC (San Diego Supercomputing Center).

**Refereed Journal Publications (* first author)**

*1* "Stratified Kolmogorov Flow: Part II"
**Journal of Fluid Mechanics**, accepted, to appear in 2005 *with N. Balmforth*

*2** "Registration-Based Morphing of Active Contours for Segmentation of CT Scans"
**Mathematical Biosciences and Engineering 2** (1) pp 79-96, 2005 *with D. Levy*

*3* "A comparative study of the turbulent Rayleigh-Taylor instability using high-resolution 3D numerical simulations: The Alpha-Group collaboration"
**Physics of Fluids 16** (5) pp 1668-1693, 2004 *with G. Dimonte and the alpha-group*

*4* "Weakly non-linear analysis of wind-driven gravity waves"
**Journal of Fluid Mechanics 503** 171, 2004 *with A. Alexakis and R. Rosner*

*5* "A hybrid Eulerian-Lagrangian method for LES of atomising spray"
**Advances in Fluid Mechanics 37** 313, 2004 *with F. Ham, S. Apte and M. Herrmann*

*6** "Whirling and defect chaos in non-Boussinesq convection"
**New Journal of Physics 5** 135.1-135.16, 2003 *with H. Riecke and W. Pesch*

*7**. "Penta-hepta defect chaos in a model for rotating hexagonal convection"
**Physical Review Letters 90** 134502, 2003 *with H. Riecke*

*8**. "Induced defect nucleation and side-band instabilities in hexagons with rotation and mean flow"
**Physica D 176** pp 107-124, 2003 *with H. Riecke*

*9.* "Universality of scalar statistics in stably stratified turbulence",
**Physical Review E 66** 016306, 2002 *with S. Wunsch*

*10**. "Mean flow in the hexagonal convection: stability and nonlinear dynamics"
**Physica D 163** pp 166-183, 2002 *with H. Riecke*

*11.* "Shear instability of fluid interfaces: Stability analysis"
**Physical Review E 65** 026313, 2002 *with A. Alexakis and R. Rosner*

*12.* "Stratified Kolmogorov flow"
**Journal of Fluid Mechanics 450** pp 131-167, 2002 *with N. Balmforth*

*13.* "On the C/O Enrichment of Novae Ejecta"
**Astrophysical Journal Letters 562** pp L177-L179, 2001 *with R. Rosner, A. Alexakis, J. Truran and W. Hilderbrandt*

*14**. "On the miscible Rayleigh-Taylor instability: two and three dimensions"
**Journal of Fluid Mechanics 447** pp 377-408, 2001 *with H. Tufo, A. Dubey and R. Rosner*

*15.* "Flash code: Studying astrophysical thermonuclear flashes"
**Computing in Science and Engineering (AIP) 2**, pp 33-41, 2000 *with R. Rosner and the FLASH team*

*16**. "Numerical simulation of double-diffusive convection in a rectangular box"
**Physical Review E 61** pp 2676-2694, 2000 *with R. Rosner*

*17**. "Linear and Weakly nonlinear analysis of doubly diffusive vertical slot convection"
**Physical Review E 57** pp 5554-5563, 1998 *with R. Rosner*

*18**. "Linear stability analysis of doubly-diffusive vertical slot convection"
**Physical Review E 57** pp 1183-1186, 1998 *with R. Rosner*

**Submitted papers**

**1.** Young, Y.-N.
Ham, F., Riemer, N. ,Herrmann, M. and Cristini, V.
"Drop size distribution in turbulent two-phase flows",
submitted to **Physics of Fluids**

**General Publications**

**1.** Young, Y.-N., Ferziger, J., Ham, F. and Herrmann, M.
"Turbulent mixing of multiphase flows"
**CTR Annual Review Brief** 2003

**2.** Young, Y.-N., Miesch, M. and Mansour, N. N.
"Subgrid scale modeling in solar convection simulations using ASH"
**CTR Annual Review Brief** 2003

**3.** Ham, F. and Young, Y.-M.
"A Cartesian adaptive level set method for two-phase flows"
**CTR Annual Review Brief** 2003

**4.** Young, Y.-N., Apte, S., Ham, F., Mansour, N. and Herrmann, M. "Transition from Eulerian to Lagrangian description of multiphase flows using the particle level set method"
**ILASS Americas 15th annual conference on liquid atomization and spray systems, Monterey, CA May 2003** May, 2003

**5.** Young, Y.-N., Ham, F. and Mansour, N.
"Interaction between turbulent flow and free surfaces"
**CTR Annual Review Brief, 2002** December, 2002

**6.** Young, Y.-N. and Balmforth, N. "Stratified Kolmogorov flow"
**Proceedings of the 12th Taylor-Couette Conference** September, 2001

**7.** Young, Y.-N.
"Numerical simulation of double-diffusive convection and miscible Rayleigh-Taylor instability" (PhD dissertation) **University of Chicago press** March, 2000

**8.** Young, Y.-N. "On Stratified Kolmogorov flow"
**Woods Hole Oceanographic Institution Tech Report**, WHOI-2000-07.
October, 2000

**9.** Young, Y.-N., Tufo, H., Dubey, A. and Rosner, R.
"On the miscible Rayleigh-Taylor instability: 2D versus 3D"
**Proceedings of the 2000 ICTAM meetings at Chicago** ISSN 0073-5264, No. 950.
September, 2000

**10.** ASCI/FLASH astro and code groups
"Connecting Astrophysics to Laboratory Fluid Dynamics: Astrophysical Thermonuclear Flashes", Invited paper in **American Institute of Aeronautics and Astronautics (AIAA)**, 99-3649 (A99-33671) 1999

**Work in progress**

**1.** with Mike Siegel et al.
"Effects of surfactants on pinch-off", in preparation.

**2.** with Dan Goldman and V. Cristini et al.
"Oxygen (nutrient) transport in tumor growth: simulations and modeling", in preparation.

**Teaching**

INSTRUCTOR, M614 Numerical Methods I
Department of Mathematical Sciences,
NJIT, Newark, NJ — Winter, 2005

INSTRUCTOR, M337 Linear Algebra
Department of Mathematical Sciences,
NJIT, Newark, NJ — Autumn, 2004

INSTRUCTOR, Review Calculus for Engineering Freshmen
Department of Engineering Sciences and Applied Mathematics,
Northwestern University, Evanston, IL — Autumn, 2001

TEACHING ASSISTANT, Natural Sciences 101 (Freshman level astronomy)
Department of Astronomy and Astrophysics,
University of Chicago, Chicago, IL — Autumn, 1997

TEACHING ASSISTANT, Physical Sciences 101, 102, 103 (Freshman level astronomy)
Department of Astronomy and Astrophysics,
University of Chicago, Chicago, IL — 1994-1995

INSTRUCTOR, Experimental Modern Physics (Junior level physics)
Department of Physics, National Taiwan University, Taipei, Taiwan — 1993-1994

**Professional Societies and Activities**

- Society
  *American Physical Society*
  *Society of Industrial and Applied Mathematics*
- Reviewer
  **Journal of Fluid Mechanics**
  **Physical Review E**
  **Physical Review Letters**
  **Journal of Geophysical and Astrophysical Fluid Dynamics**
  **Canadian Journal of Physics**
  **Georgian-US inter-government funding**

**Selected Presentations (from Dec 1998 to Nov 2004)**

- Dept. of Mechanical Engineering, NJIT, "Drop size distribution in turbulent two-phase flows", Oct, 2004
- Dept. of Mathematical Sciences, NJIT, "Mixing of two fluids: from an interfacial instability to bubble(drop) dynamics in turbulence", March, 2004
- Dept. of Mathematics, University at Buffalo, SUNY, "Particle level set method in CFD and image processing", November, 2003
- APS (American Physical Society)/DFD (Division of Fluid Dynamics) 56th annual meeting, "Turbulent mixing of multiphase flow", November, 2003
- APS/DFD 56th annual meeting, "Cell-laden blood flow in the artery", November, 2003

• APS/DFD 56th annual meeting, "Sub-grid scale modeling in solar convection simulations using ASH", November, 2003

• Computation in Science seminar at the University of Chicago, "Application of a hybrid level method to image processing and mixing of multiphase flow", August, 2003

• IGPP-IPAM/UCLA worksohp, "Sub-grid scale modeling in an-elastic solar convection simulations", July, 2003

• ILASS2003, "Transition from Eulerian to Lagrangian description of multiphase flow using the particle level set method", May, 2003

• Seventh SIAM Snowbird conference, "Statistics of levels in turbulent flow", May, 2003

• APS/DFD 55th annual meeting, "Penta-hepta defect chaos in a model for rotating convection with mean flow", November, 2002

• Center for Turbulence Research Seminar, Stanford University, "Wind-driven gravity waves: instability, weakly non-linear analysis and mixing properties", November, 2002

• Woods Hole Oceanographic Institution (WHOI), Mini symposium on rotating convection, "Penta-hepta defect chaos in non-Boussinesq rotating convection at low Prandtl numbers", July, 2002

• Dept. of Mathematics, University at Buffalo, SUNY, "Pattern formation and non-linear dynamics in fluid mechanics", December, 2001

• APS/DFD 54th annual meeting, "Mean flow in hexagonal convection: stability and non-linear dynamics", November, 2001

• Sixth SIAM Snowbird conference, "Mean flow in hexagonal convection: stability and nonlinear dynamics", May, 2001

• Dept. of Applied Mathematics and Statistics, State University of New York, Stony Brook, "On the miscible Rayleigh-Taylor instability", February, 2001

• APS/DFD 53rd annual meeting, "Dynamics of internal boundary layers in stratified Kolmogorov flow", November, 2000

• APS/DFD 53rd annual meeting, "DNS of wind-driven breaking waves", November, 2000

• Computations in Science Seminars, Department of Physics, University of Chicago, "Stratified Kolmogorov Flow", September, 2000

• International Congress of Theoretical and Applied Mechanics (ICTAM) 2000 Meeting, " Miscible Rayleigh-Taylor instability: 2D versus 3D", September, 2000

• American Astronomical Society, 196th Meeting, Thesis presentation, "Miscible Rayleigh-Taylor Instability: 2D versus 3D", June, 2000

- Dept. of Applied Mathematics and Statistics, State University of New York, Stony Brook, “On stratified Kolmogorov flow”, May, 200

- 3rd International Conference on Laboratory Astrophysics with Intense Laser, “Miscible Raleigh-Taylor Instability: 2D versus 3D”, March, 2000

- APS/DFD 52nd annual meeting, “On the miscible Rayleigh-Taylor Instability: 2D versus 3D”, November, 1999

- APS/DFD 52nd annual meeting, “On stratified Kolmogorov shear flow”, November, 1999

- Computational and Applied Math/Nonlinear PDEs Seminars, Department of Mathematics, University of Chicago, “Stratified Kolmogorov shear flow”, September, 1999

- Computational and Applied Math/Nonlinear PDEs Seminars, Department of Mathematics, University of Chicago, “Layer dynamics in doubly-diffusive convection ”, December, 1998

**References**

**Prof. Robert Rosner**, r-rosner@uchicago.edu, (773) 702-0560
Department of Physics and Department of Astronomy and Astrophysics
University of Chicago

**Prof. Hermann Riecke**, h-riecke@northwestern.edu, (847) 491-3345, (847) 491-8316
Department of Engineering Sciences and Applied Mathematics,
Northwestern University

**Prof. Todd Dupont**, dupont@cs.uchicago.edu, (773) 702-3485
Department of Computer Science and Department of Mathematics,
University of Chicago

**Prof. Doron Levy**, dlevy@math.stanford.edu, (650) 723-4157
Department of Mathematics,
Stanford University

**Prof. Neil J. Balmforth**, njb@cse.ucsc.edu
Department of Applied Maths and Statistics, School of Engineering
University of California, (831) 459-3753