

## **Fang Li-Zhi**

Position: Professor of Physics and Astronomy

University of Arizona

Period covered: 1992- present



### **I Scientific Work**

In recent years Fang's research focus on non-equilibrium and non-linear problems of cosmology. It includes the turbulence behavior of the mass and velocity fields of cosmic baryon fluid; the radiative transfer of resonant photons in halos around photon sources in the early universe, and the 21 cm signal from the epoch of reionization.

### **II Conferences and educational activities**

Colloquium: Scaling in Cosmology, Institute of Physics, Academia Sinica, Taipei, May 30, 2007

Invited lectures: 1. the standard cosmological model  
2. primordial perturbations  
3. nonlinear evolution of intergalactic medium (IGM)  
4. probe of dark energy with large scale structures

Taipei School/Workshop on Large Scale Structures of the Universe  
National Center for Theoretical Science, May 28 – June 2, 2007

Colloquium: Studying cosmic baryon fluid with cosmological hydrodynamic simulation, Department of Mathematics, State University of New York at Stony Brook, February 20, 2008

Colloquium: Studying cosmic baryon fluid with hydrodynamic simulation, Institute of Physics, Academia Sinica, Taipei, May 27, 2008

Colloquium: 21 cm signals from early universe, Department of Physics, DongHwa University, HuaLien, Taiwan, June 2, 2008

Invited talk: Intermittency of cosmic baryon fluid, 5<sup>th</sup> meeting on relativistic astrophysics, Taipei, May 28, 2008

Colloquium: A fundamental physical problem in 21 cm cosmology The university of Texas at Arlington, April,1, 2009

Colloquium: The zeroth law of the thermodynamics of photon-atom system and 21 cm cosmology, National Taiwan University, June 16, 2009

### *Work With Students*

1. Ishani Roy: She works with me on A WENO algorithm for radiative transfer with resonant scattering and the Wouthuysen-Field Coupling, *New Astronomy*, 14, 513, (2009)
2. Yi Lu: She works with me on Log-Poisson hierarchical clustering of cosmic neutral Hydrogen and Ly-alpha transmitted flux of QSO absorption spectrum, *Astrophys. J.* 691, 43, (2009)
3. Jian-Mei Qiu: She worked with me on WENO algorithm of radiative transfer equation. Four papers (*ApJ*, and *New Astronomy*) have been published. She obtained her PhD degree on 2007.

### *Diploma thesis supervision*

Hu Zhan, obtained his PhD degree  
Thesis: The Large-Scale Structure of the Universe in One Dimension.

### *Teaching Duties*

Phys571 (general relativity and cosmology)  
Phys195A (creation of the universe)  
Phys596F (Cosmology and particle astrophysics)  
Phys515 (Electrodynamics)

### *Work With Postdocs*

1. Postdoc: Tong-Jie Zhang (stay in my group from June 1, 2005 - May 31, 2006)  
Publications in this period:
  1. X-ray emission of baryonic gas in the universe: luminosity-temperature relationship and soft band background, *ApJ*, 642, 625 (2006)
  2. Scaling relation between Sunyaev-Zel'dovich effect and X-ray luminosity and scale-free evolution of cosmic baryon field, *New Astronomy*, 14, 152, (2009)
2. Postdoc: Ji-Ren Liu (stay in my group from Aug 8 2006 – Dec 2008)  
Publications in this period:
  1. Is the cosmic UV background fluctuating at redshift  $z \sim 6$ ? *ApJL*, 645, 1, (2006)
  2. Non-Gaussianity of the cosmic baryon fluid: log-Poisson hierarchy model, *Astrophys. J.*, 672, 11, (2008)
  3. Ly-alpha Leaks and Reionization, *Mon. Not. R. Astr. Soc.*, 383, 1459, (2008)
3. Postdoc, Wen Xu (stay in my group from Sep 2008 – March 2009)  
Publications in this period:
  1. Time evolution of Wouthuysen-Field coupling, *Astrophys. J.* 694, 1121, (2009)
  2. Wouthuysen-Field coupling in 21 cm region around high redshift sources, *Astrophys. J.*, 703, 1992, (2009)

## **III Service activities**

### *Within ICRANet*

Organizing the 4<sup>th</sup> - 6<sup>th</sup> Italian-Sino Workshop

Member and Chair of Steering Committee

*Outside ICRANet*

Editor, International Journal of Modern Physics A (2003 - )

Editor, Modern Physics Letters A (2003 - )

**2009 List of Publications**

Scaling relation between Sunyaev-Zel'dovich effect and X-ray luminosity and scale-free evolution of cosmic baryon field, Q. Yuan, H.Y. Wan, T.J. Zhang, J.R. Liu, L.L. Feng and L.Z. Fang, *New Astronomy*, 14, 152

Log-Poisson hierarchical clustering of cosmic neutral hydrogen and Ly $\alpha$  transmitted flux of QSO absorption spectrum, Y. Lu, Y.Q. Chu, and L. Z. Fang, *Astrophys. J.* 691, 43

Time evolution of Wouthuysen-Field coupling, I. Roy, W. Xu, J.M. Qiu, C.W. Shu and L.Z. Fang, *Astrophys. J.* 694 1121.

AWENO algorithm for radiative transfer with resonant scattering and the Wouthuysen-Field Coupling, I. Roy, J.M. Qiu, C.W. Shu and L.Z. Fang, *New Astronomy*, 14, 513

Wouthuysen-Field coupling in 21 cm region around high redshift sources, I. Roy, W. Xu, J.-M. Qiu, C.-W. Shu, and L. Z. Fang, *Astrophys. J.*, 703, 1992

The zeroth Law of thermodynamics of photon-hydrogen system and 21 cm cosmology, Li.Z. Fang, *Int. J. of Mod. Phys. D*, in press