Ue-Li Pen
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I. EDUCATION

1996 Ph.D. in Astrophysics, Princeton University
1991 Master of Science, National Chiao-Tong University
1989 Bachelor of Science, National Taiwan University

II. EMPLOYMENT

1998 – present	Professor, Canadian Institute for Theoretical Astrophysics, University of Toronto
2016 – 2019	Interim Director Canadian Institute for Theoretical Astrophysics, University of Toronto
2017 – present	TD Lee Visiting Professor Shanghai Jiao Tong University, Shanghai
1997 – present	Adjunct Research Fellow Academia Sinica Institute for Astronomy and Astrophysics, Taiwan
2014 – present	Associate Perimeter Institute for Theoretical Physics, Waterloo, Canada

III. FELLOWSHIPS AND AWARDS

2020	Governor General's Innovation Awards Project Title: *Canadian Hydrogen Intensity Mapping Experiment (CHIME)*
2019	2020 Breakthrough Prize in Fundamental Physics (1/347 share)
2018	Humboldt Prize
2018	Simons Investigator Award
1995 – 1998	Harvard Junior Fellow
1994 – 1995	Princeton Porter Ogden Jacobus Fellowship Citation: *The highest honorific fellowship awarded by the Graduate School is conferred annually upon the student who, in the judgement of the University faculty, displayed the highest scholarly excellence.*
1994	Ray Grimm Computational Physics Prize
1990 – 1991	Taiwan Ministry of Education Graduate Scholarship

IV. SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

2007 – 2024	17 Postdocs/ 18 PhD/ 8 Master Students/Master Thesis Canadian Institute for Theoretical Astrophysics, University of Toronto

V. TEACHING ACTIVITIES

1998 – present	Faculty, University of Toronto, CITA, cross appointments to Dept of Physics and Dept of Astronomy and Astrophysics, regularly taught courses in three departments. Minimal current obligations.

VI. ORGANISATION OF SCIENTIFIC MEETINGS

2016 – 2019	Scintillometry Workshops. *Annual: Bonn (2016), Toronto (2017), Shanghai (2018), Bonn (2019)*
2019	Galaxy Angular Momentum Alignment, SOC, TDLI, Shanghai

VII. MAJOR COLLABORATIONS

2013 – present	Thoth Technology Inc., Real time VLBI, Canadian Institute for Theoretical Astrophysics
2013 – present	CHIME, CHIME-FRB, CHIME-VLBI
2012 – present	Pulsar Scintillometry
2011 – 2018	CAASTRO (ARC Centre of Excellence for All-sky Astrophysics), Australia
2015 – 2018	TianNu collaboration: implemented world's large N-body simulation on then fastest supercomputer, TianHe-2, info at https://www.cita.utoronto.ca/~haoran/thnu/movie.html

VIII. Most Significant Contributions

1. *21cm cosmology*

21cm cosmology investigates the radio emissions of intergalactic hydrogen gas at the 21 cm wavelength. This technique has revealed much about the early Universe, including the so-called Dark Ages and the Epoch of Reionization. I am an internationally-recognized leader in this field whose work opened a new window for the precision study of dark energy and neutrinos. I have published a series of 26 papers on this topic since 2006, which have garnered over 1,368 citations.

Li, Dongzi; Zhu, Hong-Ming; Pen, Ue-Li. Cross-correlation of the kinematic Sunyaev-Zel'dovich effect and 21 cm intensity mapping with tidal reconstruction. (2019). Physical Review Research. 100(2): id.023517.

Zhu, Hong-Ming; Pen, Ue-Li; Yu, Yu; Chen, Xuelei. (2018). Recovering lost 21 cm radial modes via cosmic tidal reconstruction. Physical Review D. 98(4): id.043511.

Anderson, C. J.; Luciw, N. J.; Li, Y.-C.; Kuo, C. Y.; Yadav, J.; Masui, K. W.; Chang, T.C.; Chen, X.;Oppermann, N.; Liao, Y.-W.; Pen, U.-L.; Price, D. C.; Staveley-Smith, L.; Switzer, E. R.; Timbie, P. T.;Wolz, L. (2017). Low-amplitude clustering in low-redshift 21-cm intensity maps cross-correlated with 2dF galaxy densities. Monthly Notices of the Royal Astronomical Society. 476(3): 3382-3392.

2. *Fast Radio Bursts*

Fast radio bursts are one of the most important topics in astrophysics today. My earlier work on 21cm intensity mapping contributed to the ambitious CHIME observatory, which has turned Canada into a world leader in the search for FRBs. Since directly entering this field in 2015, I have published 8 papers with over 213 citations.

CHIME/FRB Collaboration. (2020). A repeating fast radio burst source localized to a nearby spiral galaxy. Nature.577(7789): 190-194.

CHIME/FRB Collaboration. (2020). Periodic activity from a fast radio burst source, accepted by Nature.

CHIME/FRB Collaboration. (2019). A second source of repeating fast radio bursts, Nature, 566(7743):235-238
CHIME/FRB Collaboration. (2019). Observations of Fast Radio Bursts at Frequencies down to 400 Megahertz. Nature. 566(7743): 230-234.
Masui, K., Lin, H., Pen, U.L., et al. (2015). "Dense magnetized plasma associated with a fast radio burst". Nature, 528(7583), 523525G.

3. Pulsar measurements of fundamental physics

I pioneered the new field of pulsar scintillometry in 2012. I have published 16 papers in this area which are not starting to receive attention, with a preliminary 83 citations. This series demonstrates the ability of scintillometry to precisely localize gravitational wave sources, constrain scalar gravitational modes, supernova neutrinos, and more.

Main, R., Yang, I. –S., Chan, V., Li, D., Lin, F. X., Mahajan, N., Pen, U.-L., van Kerkwijk, M. (2018). Pulsar emission amplified and resolved by plasma lensing in an eclipsing binary. Nature 557, 522-525.
Pen, UeLi; Macquart, JeanPierre; Deller, Adam T.; Brisken, Walter. (2014). "50 picoarcsec astrometry of pulsar emission", MNRAS, 440, 36.

4. Cosmic Structure

This has been an ongoing interest of mine since my PhD work. I have published over 100 papers in this area that have received over 7,000 citations since 1994. Recent examples include:

Yu, H.R., Pen, U., Wang, X. (2018). Parity-odd Neutrino Torque Detection. Submitted to Physical Review Letters, Retrieved from arXiv:1810.11784
Yu et al. (2017). Differential Neutrino Condensation onto Cosmic Structure, Nature Astronomy 1, 0143.
Pen and Turok. (2016) Shocks in the early universe, Physical Review Letters 117, 1301