

CURRICULUM VITAE

PERSONAL DATA

Full Name: Lei Xu (徐磊)
Office Address: Science Center North Block 308, Physics Department, the Chinese University of Hong Kong
Telephone No.: 852-39436307
Fax No: 852-26035204
E-mail Address: xuleixu@cuhk.edu.hk
Webpage (URL): <http://www.phy.cuhk.edu.hk/~xulei/homepage/index.html>

PROFESSIONAL EXPERIENCE

2018-now Professor, Physics Department, The Chinese University of Hong Kong.
2015-2018 Associate Professor, Physics Department, The Chinese University of Hong Kong.
2009-2015 Assistant Professor, Physics Department, The Chinese University of Hong Kong.

EDUCATION & TRAINING

2006-2009 Harvard University, School of Engineering and Applied Sciences, Postdoc Fellow (advisor: Prof. David Weitz).
2000-2006 The University of Chicago, Department of Physics, Ph.D. study (advisor: Prof. Sidney Nagel).
1995-2000 The University of Science and Technology of China, Department of Physics, Undergraduate Study (advisor: Prof. Rochuan Fang).

MAIN RESEARCH INTERESTS

- Mechanical metamaterials
- Hydrodynamic metamaterials
- Fluid mechanics: liquid-solid impact, splash, and droplet coalescence
- Crystallization
- Glass transition
- Active matter

LIST OF PUBLICATIONS (* indicates the corresponding author)

1. “Realizing multifunctional metamaterial for fluid flow in a porous medium”, M. Chen, X. Shen, Z. Chen, J. H. Y. Lo, Y. Liu, X. Xu, and **L. Xu***, *Proceedings of the National Academy of Sciences (PNAS)* **119**, No. 49, e2207630119, 2022.
2. “Designing Amorphous Networks with Adjustable Poisson Ratio from a Simple Triangular Lattice”, Z. Jin, C. Fang, X. Shen, L. Xu, *Physical Review Applied* **18** (5), 054052, 2022.
3. “Revealing the three-component structure of water with principal component analysis (PCA) on X-ray spectra”, Z. Jin, J. Zhao, Gang Chen, Guo Chen*, Z. Luo* and **L. Xu***, *Soft Matter* **18**, 7486–96, 2022 (featured on the front cover).
4. “Realizing the Thinnest Hydrodynamic Cloak in Porous Medium Flow” M. Chen, X. Shen, and L. Xu. *The Innovation* **3**, no. 4, 100263, 2022.
5. “Achieving adjustable elasticity with non-affine to affine transition”, X. Shen, C. Fang, Z. Jin, H. Tong, S. Tang, H. Shen, N. Xu, J. H. Y. Lo*, X. Xu* and **L. Xu***, *Nature Materials* **20**, 1635-1642, 2021.
6. “Fast crystal growth at ultra-low temperatures”, Qiong Gao, Jingdong Ai, Shixiang Tang, Minhuan Li, Yanshuang Chen, Jiping Huang, Hua Tong, **Lei Xu**, Limei Xu*, Hajime Tanaka* and Peng Tan*, *Nature Materials* **20**, 1431-1439, 2021.
7. “The role of drop shape in impact and splash”, Q. Liu, J. H. Y. Lo*, Y. Li, Y. Liu, J. Zhao and

- Lei Xu***, *Nature Communications* **12**, 3068, 2021.
8. "Diffusion-Dominated Pinch-Off of Ultralow Surface Tension Fluids", H. Y. Lo, Y. Liu, S. Y. Mak, Z. Xu, Y. Chao, K. J. Li, H. C. Shum*, and **L. Xu***, *Phys. Rev. Lett.* **123**, 134501, 2019
 9. "A universal state and its relaxation mechanisms of long-range interacting polygons", H. Shen, H. Tong, P. Tan* and **L. Xu***, *Nature Communications* **10**, 1737, 2019.
 10. "Application of Microfluidics in Wearable Devices", G. Chen*, J. Zheng, L. Liu, and **L. Xu***, *Small Methods* **3**, 1900688, 2019.
 11. "Drop expansion driven by bubbling on microscale patterned substrates under low air pressure", J. Zheng, J. Li, Y. Huang, S. Wang, G. Chen*, **L. Xu**, *Chemical Engineering Journal* **391**, 123547, 2019.
 12. "Emergence of Droplets at the Nonequilibrium All-Aqueous Interface in a Vertical Hele-Shaw Cell", Y. Chao, S. Y. Mak, Q. Ma, J. Wu, Z. Ding, **L. Xu**, H. C. Shum*, *Langmuir* **34**, 3030, 2018
 13. "Mechanism of Contact between a Droplet and an Atomically Smooth Substrate", H. Y. Lo, Y. Liu and **L. Xu***, *Phys. Rev. X* **7**, 021036, 2017.
 14. "Probing the Role of Mobility in the Collective Motion of Nonequilibrium Systems", H. Shen, P. Tan* and **L. Xu***, *Phys. Rev. Lett.* **116**, 048302, 2016.
 15. "Superhydrophobic-like tunable droplet bouncing on slippery liquid interfaces", Chonglei Hao, Jing Li, Yuan Liu, Xiaofeng Zhou, Yahua Liu, Rong Liu, Lufeng Che, Wenzhong Zhou, Dong Sun, Lawrence Li, **Lei Xu** and Zuankai Wang*, *Nature Communications*, **6**, 7986, 2015.
 16. "Kelvin–Helmholtz instability in an ultrathin air film causes drop splashing on smooth surfaces", Y. Liu, P. Tan* and **L. Xu***, *PNAS*, **112**, 3280-3284, 2015.
 17. "Visualizing kinetic pathways of homogeneous nucleation in colloidal crystallization", P. Tan, N. Xu and **L. Xu***, *Nature Physics*, **10**, 73-79, 2014.
 18. "Coalescence of Pickering Emulsion Droplets Induced by an Electric Field", G. Chen, P. Tan*, S. Chen, J. Huang, W. Wen and **L. Xu***, *Phys. Rev. Lett.* **110**, 064502, 2013.
 19. "Eliminating cracking during drying", Q. Jin, P. Tan, A. Schofield and **L. Xu***, *Eur. Phys. J. E* **36**, 28, 2013.
 20. "Compressible air entrapment in high-speed drop impacts on solid surfaces", Y. Liu, P. Tan and **L. Xu***, *J. Fluid Mech.* **716**, R9, 2013.
 21. "Understanding the low-frequency quasilocalized modes in disordered colloidal systems", P. Tan, N. Xu, A. Schofield and **L. Xu***, *Phys. Rev. Lett.*, **108**, 095501, 2012.
 22. "Hierarchical Porous Materials Made by Drying Complex Suspensions", A. R. Studart, J. Studer, **L. Xu**, K. Yoon, H. Shum, and D. A. Weitz, *Langmuir*, **27**, 955–964, 2011.
 23. "Instability development of a viscous liquid drop impacting a smooth substrate", **L. Xu***, *Phys. Rev. E*, **82**, 025303(R), 2010.
 24. "Drying of complex suspensions", **L. Xu***, A. Berges, P. Lu, A. Studart, H. Oki, A. Schofield, S. Davis and D. Weitz, *Phys. Rev. Lett.*, **104**, 128303, 2010.
 25. "Dynamics of drying in 3D porous media", **L. Xu**, S. Davis, A. Schofield and D. Weitz*, *Phys. Rev. Lett.*, **101**, 094502, 2008.
 26. "Towards the zero-surface-tension limit in granular fingering instability", X. Cheng, **L. Xu**, A. Patterson, H. M. Jaeger and S. R. Nagel*, *Nature Physics*, **4**, 234, 2008.
 27. "Splashing of liquids: Interplay of surface roughness with surrounding gas", **L. Xu**, L. Barcos and S. R. Nagel*, *Phys. Rev. E*, **76**, 066311, 2007.
 28. "Liquid drop splashing on smooth, rough, and textured surfaces", **L. Xu***, *Phys. Rev. E*, **75**, 056316, 2007.
 29. "Drop Splashing on a Dry Smooth Surface", **L. Xu**, W. W. Zhang and S. R. Nagel*, *Phys. Rev. Lett.* **94**, 184505, 2005.

PATENTS

1. Patent application filed in U.S.A., "REALIZING THE NANO-AMORPHOUS STATE OF MATERIALS INSIDE NANO-POROUS TEMPLATES", inventors: Lei XU, David WEITZ, Zhuo XU, and Changliang ZHU, Application Number: 17/313,528, Filing date: May/06/2021, filed to: United States Patent and Trademark Office, Publication Number: US 2022/0354796 A1, publication date: 10 November 2022 .

2. Patent application filed in China, “在纳米多孔模板内实现材料的纳米非晶态”, 发明人: 徐磊, D. A. 韦茨, 许卓, 朱昌良, 申请编号: 356338749, 申请时间: 2021-05-06, 中国国家知识产权局, 发表编号: CN 115300448 A, 发表时间: 2022年11月8日。
3. Patent application filed in China, “用于多孔介质的流场调节装置及调节方法”, 发明人: 沈翔瀛, 陈梦瑶, 徐磊, 徐辛亮, 申请编号: 202210937497.4, 申请时间: 2022年8月5日。
4. Patent application filed in China, “一种置于多孔介质背景的隐身斗篷及应用”, 发明人: 陈梦瑶, 沈翔瀛, 徐磊, 申请编号: 202210475965.0, 申请时间: 2022-04-29。
5. Provisional Patent application filed in U.S.A., “ULTRA THIN HYDRODYNAMIC CLOAK”, inventors: Lei Xu, Mengyao Chen, Xiangying Shen, Application Number: 63/364, 398, Filing date: May/09/2022, filed to: United States Patent and Trademark Office.

RESEARCH GRANTS

Principal Investigator, (GRF grant, “Probing the unified picture of heterogeneous and homogeneous nucleation with rate process”), (The Research Grants Council), 01/10/2022-30/09/2025, HK\$ 870,000.

Principal Investigator, (GRF grant, “Designing and realizing multifunctional hydrodynamic metamaterial in a porous medium”), (The Research Grants Council), 01/10/2021-30/09/2024, HK\$ 666,015.

Principal Investigator, (面上项目, “拓扑力学超构材料的理论探索与实验制备”), (国家自然科学基金委员会), 01/01/2021-31/12/2023, RMB 630,000.

Principal Investigator, (GRF grant, “Illustrating the effect of droplet shape in the impact of a droplet onto a solid substrate”), (The Research Grants Council), 01/10/2020-30/09/2023, HK\$ 666,512.

Principal Investigator, (广东省面上项目, “基于阻塞态机理的可调力学超构器件”), (Guangdong Basic and Applied Basic Research Fund), RMB 100000, 01/10/2019-30/9/2022.

Principal Investigator, (GRF grant, “Probing the origin of nucleation precursors in colloidal crystallization”), (The Research Grants Council), 01/10/2018-30/09/2021, HK\$ 505,298.

Collaborating Principle Investigator, (CRF grant, “Bio-inspired Surface Engineering for Phase Change Heat Transfer: From Fundamental Understanding to Practical Applications”), (The Research Grants Council), 01/02/2018-31/01/2021, HK\$ 500,000.

Principal Investigator, (GRF grant, “Understanding the heterogeneous nucleation kinetics and its major difference from the homogeneous nucleation in colloidal crystallization”), (The Research Grants Council), 01/10/2015-30/09/2018, HK\$ 501,255.

Collaborating Principle Investigator, (CRF grant, “Dynamics of Soft Matter at Interfaces: Theory, simulations and experiments”), (The Research Grants Council), 01/04/2015-31/03/2018, HK\$ 728,000 (HK\$ 5,100,000 shared by 7 collaborating groups).

Principal Investigator, (ECS grant CUHK404912, “Studying oil invasion, distribution and collection in sand with direct imaging techniques”), (The Research Grants Council), 01/10/2012-30/09/2015, HK\$ 1,250,000.

Principal Investigator, (GRF grant CUHK404211, “Studying the dynamics of drying with direct imaging techniques”), (The Research Grants Council), 01/10/2011-30/09/2014, HK\$ 710,000.

AWARDS AND HONORS

1. Research Excellence Award, The Chinese University of Hong Kong, 2020.
2. Young Scientist Award, The Optical Society of America, 2019.
3. 2014 Young Researcher Award, The Chinese University of Hong Kong, 2015.
4. Higher Education Outstanding Scientific Research Output Awards 2014, Natural Science Award Class II (中國教育部 2014 年度高等學校科學研究優秀成果獎, 自然科學獎二等獎), Ministry of Education of China, 2015.
5. Early Career Award, the University Grants Committee of Hong Kong, 12/2012.
6. USNCTAM Travel Award, U.S. National Congress on Theoretical and Applied Mechanics, 2006.
7. Student Presentation Award, Topical Group on Statistical and Non-linear Physics (GSNP), American Physical Society, 2005.
8. Grainger Fellowship, Physics Department, The University of Chicago, 2005.
9. Robert G. Sachs Fellowship, The University of Chicago, 2001.
10. The Excellent Student Scholarship, The University of Science and Technology of China, 1995-2000 (every year).

EDITORSHIP

Editorial Board Member/ Review Editor, *Frontiers in Materials Smart Materials*, 05/2014 - present.

INVITED PRESENTATIONS/ LECTURES

Invited Presentations/ Lectures at Conferences, Workshops, Research Institutes and Universities

1. “Mechanism of contact between a droplet and an atomically smooth substrate”, ChinaNANO 2017, National Center for Nanoscience and Technology, Beijing, China, Aug. 29-31, 2017.
2. “Mechanism of contact between a droplet and an atomically smooth substrate”, Asia Pacific Society for Materials Research 2017 Annual Meeting, Hokkaido, Japan, July 27-30, 2017.
3. “Mechanism of contact between a droplet and an atomically smooth substrate”, 第三屆凝聚態物理大會, Shanghai Jiaotong University, China, June 25-27, 2017.
4. “Why a droplet can contact a smooth surface so rapidly”, 第十屆全國軟物質與生命物質物理學術會議 by 中國物理學會, Xiamen, China, March 24-28, 2017.
5. “The origin of drop splashing”, 2017 NSFC-RGC Mainland China and Hong Kong Young Scholars Forum, Wuhan, January 20-23, 2017.
6. “Wetting and Splashing”, the 3th International Symposium on Bioinspired Interfacial Materials with Superwettability (iBIMwS-2017), Beihang University, Guang Zhou, January 14-17, 2017.
7. “The origin of drop splashing”, NYU Shanghai Seminar, Shanghai, 15/December/2016.
8. “The origin of drop splashing- a wind ten times stronger”, colloquium, Northwestern Polytechnical University Physics Department, Xian, 6/December/2016.
9. “Studying the collective motion of thermal and active systems with covariance matrix”, 2016 3rd International Conference on Packing Problems, Shanghai Jiaotong University, 29/8/2016.
10. “Studying the collective motion of thermal and active systems with covariance matrix”, International Soft Matter Symposium 2016, Tianjin, 26/June/2016.
11. “Studying the collective motion of thermal and active systems with covariance matrix”, PSHK Annual Meeting 2016, Hong Kong, 3/June/2016.
12. “Studying the collective motion of disordered systems with covariance matrix eigenmodes”, CityU-PKU Joint Workshop on Disorder and Disordered Materials, Hong Kong, 25/Jan./2016.
13. “Visualizing Kinetic Pathway of Homogeneous Nucleation in Colloidal Crystallization”, Physics Department Colloquium, The University of Science and Technology of China, Hefei, 7/Jan./2016.
14. “液滴飞溅的秘密”, Physics Department Seminar, Shanghai Jiaotong University, 6/Jan./2016.
15. “液滴飞溅的秘密”, Physics Department Colloquium, Fudan University, 5/Jan./2016.
16. “Fluids and complex fluids research in CUHK”, HK-CSRC Forum, Beijing Computational Science Research Center, Aug./2015.

17. “The secret of splashing”, Controlled structural formation of soft matter work shop, Kavli Institute for Theoretical Physics China at the Chinese Academy of Sciences, Beijing, Aug./2015.
18. 2015 "Neutron Scattering" Gordon Research Conference, Discussion leader, The Chinese University of Hong Kong, 21-26/June/2015
19. “Probing the role of kinetic energy in the eigenmodes of non-equilibrium systems”, International Soft Matter Symposium, Guang Dong University of Technology, Foshan, 17/May/2015.
20. “The origin of drop splashing – a wind ten times stronger”, Physics Colloquium in the City University of Hong Kong, 30/Jan./2015
21. “Visualizing kinetic pathways of homogeneous nucleation in colloidal crystallization”, the 4th International Conference on Optofluidics 2014, Guangzhou, 28-30/Aug./ 2014.
22. “The origin of drop splashing – a wind ten times stronger”, International Soft Matter Workshop, Institute of Physics Chinese Academy of Sciences, Beijing, 16-17/Aug./2014
23. “Visualizing kinetic pathways of homogeneous nucleation in colloidal crystallization”, CSRC Workshop: Statistical Physics of Active Matter, Beijing Computational Science Research Center, 24-25/June/2014.
24. “The origin of drop splashing – a wind ten times stronger”, Physical Society of HK Annual meeting, Hong Kong Baptist University, 7/6/2014.
25. “Visualizing kinetic pathways of homogeneous nucleation in colloidal crystallization”, International Conference on Frontiers of Soft Matter Physics: from Non-equilibrium Dynamics to Active Matter, The Hong Kong University of Science and Technology, Hong Kong, 13-17/Jan./2014.
26. “Coalescence of Pickering Emulsion Droplets Induced by an Electric Field”, Water Interface Workshop, National Singapore University, Singapore, 12-13/Nov./2013.
27. “Coalescence of Pickering Emulsion Droplets Induced by an Electric Field”, the 3rd international conference on optofluidics, Hong Kong, 14-17/Aug./2013.
28. “Studying low frequency quasilocalized modes in disordered colloidal systems”, the 7th International Discussion Meeting on Relaxations in Complex Systems, Barcelona, Spain, 21-26/7/2013.
29. “The secret of splashing”, Weekly Seminar of International Center for Quantum Materials, Peking University, Peking, 2/7/2013.
30. “Coalescence of Pickering Emulsion Droplets Induced by an Electric Field”, Collaborative Conference on Materials Research 2013, Juje Island, Korea, 26/6/2013.
31. “Coalescence of Pickering Emulsion Droplets Induced by an Electric Field”, The 16th Conference of the Physical Society of Hong Kong, Hong Kong, 22/6/2013.
32. “Understanding the low-frequency quasilocalized modes in disordered colloidal systems”, East Asia Joint Seminars on Statistical Physics 2012, Soochow University, Suzhou, 19/3/2012.
33. “Watching paint dry”, 2012 Bio-soft Matter Winter School, National Cheng Kung University, Tainan, 16/1/2012.
34. “The Secret of Splashing”,廣東工業大學軟物質中心成立受邀報告, 24/12/2011.
35. “The secret of splashing”, The 2nd Asia-Pacific Regional workshop for complex non-equilibrium systems., Physics Dept., CUHK, 11/11/2011
36. “The secret of splashing”, Department of Physics, Fudan University, Shanghai, 14/9/2011
37. “The secret of splashing”, 14th conference of PSHK, 11/6/2011, HKUST.
38. “The secret of splashing”, Physics Department, the Chinese University of Science and Technology of China, 4/2011
39. “The interaction between liquid viscosity and air in liquid-solid impacts”, MRSEC Workshop, “Droplet Splashing: Fundamentals & Engineering Applications”, University of Chicago, 6/2010.
40. “Dripping and drying of drops”, HKUST, Department Colloquium, 5/2/2010
41. “Dripping and drying of drops”, University of Hong Kong, Mechanical Engineering Department Seminar, 2/2009.
42. “The secret of splashing”, Chinese University of Hong Kong, Physics Department Colloquium, 1/2009.
43. “Watching paint dry”, Chinese University of Hong Kong, Physics Department seminar, 1/2009.

44. “Dynamics of drying in porous media,” The University of Chicago Computations in Science Seminar, 11/2008.
45. “Watching the paint dry,” Brandeis University MRSEC Seminar, 10/2008.
46. “What causes splashing on a dry surface?” U.S. National Congress of Theoretical and Applied Mechanics, 6/2006.
47. “The secret of splash,” Brown University Division of Applied Mathematics Seminar, 3/2006.
48. “The secret of splash: interplay of air and roughness,” APS March Meeting, 3/2006.
49. “The secret of splash,” MIT Physical Mathematics Seminar, 3/2006.
50. “The secret of splash,” Cornell University Fluid Dynamics Seminar, 2/2006.

CONFERENCE ORGANIZATION

1. Local Organizing Committee member, the *3rd International Conference of Optofluidics*, Hong Kong, 8/2013.
2. Local Organizing Committee member, the *Frontiers of Soft Matter Physics: from Non-equilibrium Dynamics to Active Matter*, Hong Kong, 1/2014

PROFESSIONAL SOCIETY ACTIVITIES

Council member, Physical Society of Hong Kong, 07/2012 – 06/2014.

Executive Committee Member, Physical Society of Hong Kong, 06/2014 – 06/2015.