

# Tsang Keung Chan: CURRICULUM VITAE

Address:	Affiliation:	Institute for Computational Cosmology
Durham University		Durham University
Physics Dept, South Road,	Email:	tsang.k.chan@durham.ac.uk
Durham DH1 3LE, England	Website:	tsangkeungchan.com
	Citizenship:	HKSAR

## Work Experience

Institute for Computational Cosmology Durham University	<b>Postdoctoral Research Associate</b>	Oct 2019 -Present
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## Education

University of California, San Diego	<b>Ph.D. in Physics</b> Thesis advisor: Prof. Dušan Kereš	2013 - 2019
The Chinese University of Hong Kong	<b>M.Phil. in Physics</b> Thesis advisor: Prof. Pui Tang Leung	2011 - 2013
The Chinese University of Hong Kong	<b>B.S. in Physics with First-class Honors</b>	2008 - 2011
University of California, Berkeley	<b>Overseas Program for Undergraduate Students</b>	Jan-Aug 2010

Research Interests: *Galaxy simulations with a focus on stellar feedback*

- Radiative Transfer in galaxy simulations
- The structure of dark matter halos
- Cosmological simulations of galaxy formation
- Cosmic ray feedback in galaxy simulations
- The origin of ultra diffuse galaxies

## Research Experiences and Skills

- Collaborating with members from different major universities, resulting in tens of publications
- Handling and analysing thousands TB data sets
- Parallel computing with MPI and OpenMP
- Running large scale simulations on several national supercomputing centers
- Programming in python, C, fortran, mathematica
- Co-developing modules in the GIZMO code

## Grants, Honors and Awards

- UC San Diego Graduate Student Association Travel Grant 2018
- UC San Diego Physics Chair's Challenge Travel Grant 2017
- Professor Charles K. Kao Student Research Exchange Scholarship 2010
- Chung Chi Scholarships for Excellence, the Chinese University of Hong Kong 2010
- Dean's Honours List, the Chinese University of Hong Kong 2009
- CN Yang Scholarship, the Chinese University of Hong Kong 2009, 2011
- Bronze medal, International Physics Olympiad 2007

## Publications

*First Author*

- [1] T. K. Chan et al. “Cosmic ray feedback in the FIRE simulations: constraining cosmic ray propagation with GeV  $\gamma$ -ray emission”. In: *MNRAS* 488 (Sept. 2019), pp. 3716–3744. DOI: 10.1093/mnras/stz1895. arXiv: 1812.10496.
- [2] T. K. Chan et al. “The origin of ultra diffuse galaxies: stellar feedback and quenching”. In: *MNRAS* 478 (July 2018), pp. 906–925. DOI: 10.1093/mnras/sty1153. arXiv: 1711.04788.
- [3] T. K. Chan, A. P. O. Chan, and P. T. Leung. “Universality and stationarity of the I-Love relation for self-bound stars”. In: *Phys. Rev. D* 93.2, 024033 (Jan. 2016), p. 024033. DOI: 10.1103/PhysRevD.93.024033. arXiv: 1511.08566 [gr-qc].
- [4] T. K. Chan et al. “The impact of baryonic physics on the structure of dark matter haloes: the view from the FIRE cosmological simulations”. In: *MNRAS* 454 (Dec. 2015), pp. 2981–3001. DOI: 10.1093/mnras/stv2165. arXiv: 1507.02282.
- [5] T. K. Chan, A. P. O. Chan, and P. T. Leung. “I-Love relations for incompressible stars and realistic stars”. In: *Phys. Rev. D* 91.4, 044017 (Feb. 2015), p. 044017. DOI: 10.1103/PhysRevD.91.044017. arXiv: 1411.7141 [astro-ph.SR].
- [6] T. K. Chan et al. “Multipolar universal relations between f-mode frequency and tidal deformability of compact stars”. In: *Phys. Rev. D* 90.12, 124023 (Dec. 2014), p. 124023. DOI: 10.1103/PhysRevD.90.124023. arXiv: 1408.3789 [gr-qc].

*Co-author*

- [1] Philip F. Hopkins et al. “But what about...: cosmic rays, magnetic fields, conduction, and viscosity in galaxy formation”. In: *MNRAS* 492.3 (Mar. 2020), pp. 3465–3498. DOI: 10.1093/mnras/stz3321. arXiv: 1905.04321 [astro-ph.GA].
- [2] Kung-Yi Su et al. “Cosmic rays or turbulence can suppress cooling flows (where thermal heating or momentum injection fail)”. In: *MNRAS* 491.1 (Jan. 2020), pp. 1190–1212. DOI: 10.1093/mnras/stz3011. arXiv: 1812.03997 [astro-ph.GA].
- [3] Ethan D. Jahn et al. “Dark and luminous satellites of LMC-mass galaxies in the FIRE simulations”. In: *MNRAS* 489.4 (Nov. 2019), pp. 5348–5364. DOI: 10.1093/mnras/stz2457. arXiv: 1907.02979 [astro-ph.GA].
- [4] Shea Garrison-Kimmel et al. “Star formation histories of dwarf galaxies in the FIRE simulations: dependence on mass and Local Group environment”. In: *MNRAS* 489.4 (Nov. 2019), pp. 4574–4588. DOI: 10.1093/mnras/stz2507. arXiv: 1903.10515 [astro-ph.GA].
- [5] Zachary Hafen et al. “The origins of the circumgalactic medium in the FIRE simulations”. In: *MNRAS* 488.1 (Sept. 2019), pp. 1248–1272. DOI: 10.1093/mnras/stz1773. arXiv: 1811.11753 [astro-ph.GA].
- [6] Suoqing Ji et al. “Properties of the Circumgalactic Medium in Cosmic Ray-Dominated Galaxy Halos”. In: *arXiv e-prints*, arXiv:1909.00003 (Aug. 2019), arXiv:1909.00003. arXiv: 1909.00003 [astro-ph.GA].
- [7] Kung-Yi Su et al. “The failure of stellar feedback, magnetic fields, conduction, and morphological quenching in maintaining red galaxies”. In: *MNRAS* 487.3 (Aug. 2019), pp. 4393–4408. DOI: 10.1093/mnras/stz1494. arXiv: 1809.09120 [astro-ph.GA].
- [8] R. E. Sanderson et al. “Reconciling Observed and Simulated Stellar Halo Masses”. In: *ApJ* 869, 12 (Dec. 2018), p. 12. DOI: 10.3847/1538-4357/aaeb33. arXiv: 1712.05808.
- [9] K. El-Badry et al. “Gas kinematics in FIRE simulated galaxies compared to spatially unresolved H I observations”. In: *MNRAS* 477 (June 2018), pp. 1536–1548. DOI: 10.1093/mnras/sty730.
- [10] M. E. Orr et al. “What FIREs up star formation: the emergence of the Kennicutt-Schmidt law from feedback”. In: *MNRAS* 478 (Aug. 2018), pp. 3653–3673. DOI: 10.1093/mnras/sty1241. arXiv: 1701.01788.

- [11] K. L. S. Yip, T. K. Chan, and P. T. Leung. “Perturbative solution to the Lane-Emden equation: an eigenvalue approach”. In: *MNRAS* 465 (Mar. 2017), pp. 4265–4280. DOI: 10.1093/mnras/stw3041. arXiv: 1611.07202 [astro-ph.SR].
- [12] K. El-Badry et al. “When the Jeans Do Not Fit: How Stellar Feedback Drives Stellar Kinematics and Complicates Dynamical Modeling in Low-mass Galaxies”. In: *ApJ* 835, 193 (Feb. 2017), p. 193. DOI: 10.3847/1538-4357/835/2/193. arXiv: 1610.04232.
- [13] M. E. Orr et al. “Stacked Star Formation Rate Profiles of Bursty Galaxies Exhibit Coherent Star Formation”. In: *ApJL* 849, L2 (Nov. 2017), p. L2. DOI: 10.3847/2041-8213/aa8f93. arXiv: 1709.10099.
- [14] P. F. Hopkins et al. “FIRE-2 simulations: physics versus numerics in galaxy formation”. In: *MNRAS* 480 (Oct. 2018), pp. 800–863. DOI: 10.1093/mnras/sty1690. arXiv: 1702.06148.
- [15] Z. Hafen et al. “Low-redshift Lyman limit systems as diagnostics of cosmological inflows and outflows”. In: *MNRAS* 469 (Aug. 2017), pp. 2292–2304. DOI: 10.1093/mnras/stx952. arXiv: 1608.05712.
- [16] F. van de Voort et al. “On the deuterium abundance and the importance of stellar mass loss in the interstellar and intergalactic medium”. In: *MNRAS* 477 (June 2018), pp. 80–92. DOI: 10.1093/mnras/sty591. arXiv: 1704.08254.
- [17] A. Fitts et al. “fire in the field: simulating the threshold of galaxy formation”. In: *MNRAS* 471 (Nov. 2017), pp. 3547–3562. DOI: 10.1093/mnras/stx1757. arXiv: 1611.02281.
- [18] A. L. Muratov et al. “Metal flows of the circumgalactic medium, and the metal budget in galactic haloes”. In: *MNRAS* 468 (July 2017), pp. 4170–4188. DOI: 10.1093/mnras/stx667. arXiv: 1606.09252.
- [19] F. van de Voort et al. “The impact of stellar feedback on hot gas in galaxy haloes: the Sunyaev-Zel’dovich effect and soft X-ray emission”. In: *MNRAS* 463 (Dec. 2016), pp. 4533–4544. DOI: 10.1093/mnras/stw2322. arXiv: 1604.01397.
- [20] K. El-Badry et al. “Breathing FIRE: How Stellar Feedback Drives Radial Migration, Rapid Size Fluctuations, and Population Gradients in Low-mass Galaxies”. In: *ApJ* 820, 131 (Apr. 2016), p. 131. DOI: 10.3847/0004-637X/820/2/131. arXiv: 1512.01235.
- [21] Y.-H. Sham et al. “Unveiling the Universality of I-Love-Q Relations”. In: *ApJ* 798, 121 (Jan. 2015), p. 121. DOI: 10.1088/0004-637X/798/2/121. arXiv: 1410.8271 [gr-qc].
- [22] Y. J. Zhang et al. “Separation of space-time and matter in polar oscillations of compact stars”. In: *MNRAS* 438 (Mar. 2014), pp. 3222–3232. DOI: 10.1093/mnras/stt2428.

### Reports

- Summer Research Report on “the effect of muon propagation on underground dark matter detection experiments”, with Prof. Kam Biu Luk in University of California Berkeley, Aug 2010

## Conferences and Workshops

### Talks

- *Talk* at VIRGO meeting at Durham University, Durham, United Kingdom 2020
- *Talk* at Durham-Edinburgh Extragalactic Workshop XVI at Durham University, Durham, United Kingdom 2020
- *Invited Talk* at CCAPP seminar at CCAPP, Ohio State University, Ohio, United States 2019
- *Invited Talk* at “*The Bewildering Nature of Ultra-diffuse Galaxies*” workshop at Lorentz Center, Leiden, Netherlands 2018
- *Talk* at ITC “*Galaxies and Cosmology*” seminar at ITC, Harvard University, Cambridge, United States 2018
- *Talk* at SFIR seminar at Princeton University, New Jersey, United States 2018
- Santa Cruz workshop on galaxy formation at University of California at Santa Cruz, United States 2015,2017,2018
- Santa Cruz workshop on galaxy formation at University of California at Santa Cruz, United States 2015,2017,2018
- Galaxy Formation and Evolution in Southern California at California institute of technology, Pasadena, United States 2017
- Feedback In Realistic Environment workshop at University of California at Berkeley, United States 2016  
at California institute of technology, Pasadena, United States 2015  
at Northwestern University, Evanston, United States 2014

### Poster Presentations

- 15th Potsdam Thinkshop on “*Understanding the role of feedback in galaxy formation*” at Potsdam, Germany 2018
- 228th American Astronomical Society meeting at San Diego, United States 2016

## Teaching

- Tutor for PHYS1122 “*Foundations of Physics I*” at Durham University 2019-20
- Teaching assistant for PHYS 7 “*Galaxies and Cosmology*” by Prof. Karin Sandstrom, at University of California at San Diego Winter 2016
- Teaching assistant for PHY2005 “*Quantitative Methods for Basic Physics II*” by Prof. Emily S.C. Ching, at the Chinese University of Hong Kong Second Term, 2013
- Teaching assistant for PHY2351 “*Basic Computational Physics*” by Dr. Lin Lap Ming, at the Chinese University of Hong Kong First Term 2012

## Outreach

- Laboratory Demonstrator at *Tech Trek* 2017
- Laboratory Demonstrator at *IOA Science & Innovation camp* 2017

## References

**Dušan Kereš, Ph.D.**

Associate Professor  
Department of Physics  
University of California, San Diego  
dkeres@physics.ucsd.edu  
*Thesis advisor*

**Eliot Quataert, Ph.D.**

Professor of Astronomy & Physics  
Astronomy Department  
University of California, Berkeley  
eliot@berkeley.edu

**Philip Hopkins, Ph.D.**

Professor of Theoretical Astrophysics  
TAPIR, Department of Astronomy  
California Institute of Technology  
phopkins@caltech.edu  
**Administrative Assistant:**  
JoAnn Boyd, joann@caltech.edu