

Tsang Keung Chan: CURRICULUM VITAE

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Work Experience

Institute for Computational Cosmology Durham University	Postdoctoral Research Associate	Oct 2019 -Present
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Education

University of California, San Diego	Ph.D. in Physics	2013 - 2019
	Thesis advisor: Prof. Dušan Kereš	
The Chinese University of Hong Kong	M.Phil. in Physics	2011 - 2013
	Thesis advisor: Prof. Pui Tang Leung	
The Chinese University of Hong Kong	B.S. in Physics with First-class Honors	2008 - 2011
University of California, Berkeley	Overseas Program for Undergraduate Students	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
- Running large scale simulations on several national supercomputing centers
- Programming in python, C, fortran, mathematica

- Parallel computing with MPI and OpenMP
- Co-developing modules in the GIZMO code
- Develop new radiation hydrodynamics method and modules in the SWIFT 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

Teaching

- Small group tutorial for PHYS1122 "*Foundations of Physics I*" at Durham University 2019-21
- 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

Supervision of MSc students

- Melissa Seabrook "*Formation of Galactic Bulges*" 2020
co-supervised with Prof. Tom Theuns, at Durham University

Professional Service

- Reviewer for International Journals (MNRAS & ApJ)

Outreach

- Introductory Video at *Royal Society Summer Science Exhibition* 2021
- Laboratory Demonstrator at *Tech Trek* 2017
- Laboratory Demonstrator at *IOA Science & Innovation camp* 2017
- Academic Officer of *Chinese University of Hong Kong Astronomy Club* 2011

Publications

As of September 2021, I have total 39 publications (7 first-author) with total 1980 citations, and H-index 23¹.

First Author

- [1] T. K. Chan et al. “The impact of cosmic rays on dynamical balance and disk-halo interaction in Lstar disk galaxies”. In: *arXiv e-prints*, arXiv:2110.06231 (Oct. 2021), arXiv:2110.06231. arXiv: 2110.06231 [astro-ph.GA].
- [2] T. K. Chan et al. “Smoothed particle radiation hydrodynamics: two-moment method with local Eddington tensor closure”. In: *MNRAS* 505.4 (Aug. 2021), pp. 5784–5814. DOI: 10.1093/mnras/stab1686. arXiv: 2102.08404 [astro-ph.IM].
- [3] T. K. Chan et al. “Cosmic ray feedback in the FIRE simulations: constraining cosmic ray propagation with GeV γ -ray emission”. In: *MNRAS* 488 (Sept. 2019), pp. 3716–3744. DOI: 10.1093/mnras/stz1895. arXiv: 1812.10496.
- [4] 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.
- [5] 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].
- [6] 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.
- [7] 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].
- [8] 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] Erin Kado-Fong et al. “The In-situ Origins of Dwarf Stellar Outskirts in FIRE-2”. In: *arXiv e-prints*, arXiv:2109.05034 (Sept. 2021), arXiv:2109.05034. arXiv: 2109.05034 [astro-ph.GA].
- [2] Cameron Trapp et al. “Gas infall and radial transport in cosmological simulations of Milky Way-mass disks”. In: *arXiv e-prints*, arXiv:2105.11472 (May 2021), arXiv:2105.11472. arXiv: 2105.11472 [astro-ph.GA].
- [3] Suoqing Ji et al. “Virial shocks are suppressed in cosmic ray-dominated galaxy haloes”. In: *MNRAS* 505.1 (July 2021), pp. 259–273. DOI: 10.1093/mnras/stab1264. arXiv: 2011.04706 [astro-ph.GA].

¹Link to ADS publication list: <https://ui.adsabs.harvard.edu/search/q=orcid%3A0000-0003-2544-054X&sort=date+desc>

- [4] Jonathan Stern et al. “Virialization of the Inner CGM in the FIRE Simulations and Implications for Galaxy Disks, Star Formation, and Feedback”. In: *ApJ* 911.2, 88 (Apr. 2021), p. 88. DOI: 10.3847/1538-4357/abd776.
- [5] Philip F. Hopkins et al. “Effects of different cosmic ray transport models on galaxy formation”. In: *MNRAS* 501.3 (Mar. 2021), pp. 3663–3669. DOI: 10.1093/mnras/staa3692. arXiv: 2004.02897 [astro-ph.GA].
- [6] Philip F. Hopkins et al. “Testing physical models for cosmic ray transport coefficients on galactic scales: self-confinement and extrinsic turbulence at \sim GeV energies”. In: *MNRAS* 501.3 (Mar. 2021), pp. 4184–4213. DOI: 10.1093/mnras/staa3691. arXiv: 2002.06211 [astro-ph.HE].
- [7] Philip F. Hopkins et al. “Cosmic ray driven outflows to Mpc scales from L_* galaxies”. In: *MNRAS* 501.3 (Mar. 2021), pp. 3640–3662. DOI: 10.1093/mnras/staa3690. arXiv: 2002.02462 [astro-ph.GA].
- [8] Alexander B. Gurvich et al. “Pressure balance in the multiphase ISM of cosmologically simulated disc galaxies”. In: *MNRAS* 498.3 (Nov. 2020), pp. 3664–3683. DOI: 10.1093/mnras/staa2578. arXiv: 2005.12916 [astro-ph.GA].
- [9] Alexandres Lazar et al. “A dark matter profile to model diverse feedback-induced core sizes of Λ CDM haloes”. In: *MNRAS* 497.2 (Sept. 2020), pp. 2393–2417. DOI: 10.1093/mnras/staa2101. arXiv: 2004.10817 [astro-ph.GA].
- [10] 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].
- [11] 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].
- [12] 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].
- [13] 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].
- [14] 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].
- [15] Suoqing Ji et al. “Properties of the circumgalactic medium in cosmic ray-dominated galaxy haloes”. In: *MNRAS* 496.4 (Aug. 2020), pp. 4221–4238. DOI: 10.1093/mnras/staa1849. arXiv: 1909.00003 [astro-ph.GA].
- [16] 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].
- [17] 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.

- [18] 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.
- [19] Kareem El-Badry et al. “Gas kinematics, morphology and angular momentum in the FIRE simulations”. In: *MNRAS* 473.2 (Jan. 2018), pp. 1930–1955. DOI: 10.1093/mnras/stx2482. arXiv: 1705.10321 [astro-ph.GA].
- [20] 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.
- [21] 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].
- [22] 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.
- [23] 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.
- [24] 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.
- [25] 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.
- [26] 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.
- [27] 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.
- [28] 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.
- [29] 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.
- [30] 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.
- [31] 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].

- [32] 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 National Astronomy Meeting
University of Bath, United Kingdom 2021
- *Talk* at SAZERAC 2.0
Online 2021
- *Talk* at Durham-Edinburgh Extragalactic Workshop XVII
at Durham University, Durham, United Kingdom 2021
- *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 2018

on “*Understanding the role of feedback in galaxy formation*”
at Potsdam, Germany

- 228th American Astronomical Society meeting 2016
at San Diego, United States

References

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