

# Tsang Keung Chan: CURRICULUM VITAE

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## Work Experience

The Chinese University of Hong Kong	<b>Assistant Professor</b>	Nov 2023
University of Chicago	<b>Inaugural Margaret Burbidge Post-Doctoral Fellow</b>	2022-2023
Institute for Computational Cosmology, Durham University	<b>Postdoctoral Research Associate</b>	2019-2022

## Education

University of California, San Diego	<b>Ph.D. in Physics</b>	2013 - 2019
	Thesis advisor: Prof. Dušan Kereš	
The Chinese University of Hong Kong	<b>M.Phil. in Physics</b>	2011 - 2013
	Thesis advisor: Prof. Pui Tang Leung	
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: *Computational Astrophysics*

- Radiative Transfer in cosmological 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
- Running large scale simulations on several national supercomputing centers

- Handling and analysing thousands TB data sets
  - Parallel computing with MPI and OpenMP
  - Develop new radiation hydrodynamics method and modules in the SWIFT code
- Programming in python, C, fortran, mathematica
- Co-developing modules in the GIZMO code

## Honors and Awards

- Margaret Burbidge Fellowship, University of Chicago 2022
- HPC-Europa3 Transnational Access programme 2021
- 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

## Grants/Proposals

- co-lead a project in Virgo II in 14th DiRAC call 2022  
*"Virgo II: The Large-scale structure of the Universe"*
- co-PI in HST Cycle 30 Proposal 2022  
*"Elucidating Galaxy Quenching with Absorption Probes of Halos around Low-mass Dwarfs"*
- co-lead a project in Virgo I in 13th DiRAC call 2020  
*"Virgo I: The formation, evolution and clustering of galaxies"*
- co-PI in HST Cycle 28 Proposal 2020  
*"A Benchmark Survey of Resolved Stellar Populations in the Nearest Ultra Diffuse Galaxy, F8D1"*

## Teaching

- Small group tutorial for PHYS1122 *"Foundations of Physics I"* 2019-22  
at Durham University
- Teaching assistant for PHYS 7 *"Galaxies and Cosmology"* 2016  
by Prof. Karin Sandstrom, at University of California at San Diego
- Teaching assistant for PHY2005 *"Quantitative Methods for Basic Physics II"* 2013  
by Prof. Emily S.C. Ching, at the Chinese University of Hong Kong
- Teaching assistant for PHY2351 *"Basic Computational Physics"* 2012  
by Dr. Lin Lap Ming, at the Chinese University of Hong Kong

## Supervision of 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 & A&A)
- Journal Club organizer at Center for Astrophysics and Space Sciences, University of California San Diego

## Outreach

- Public Talk at *Continuing Education and College Health and Science Lectures* 2023
- Introductory Video<sup>1</sup> 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 2023, I have total 48 publications (10 first-author) with total 3393 citations, and H-index 31<sup>2</sup>.

### *First Author*

- [1] Tsang Keung Chan et al. “The impact and response of minihalos and the inter-halo medium on cosmic reionization”. In: *arXiv e-prints*, arXiv:2305.04959 (May 2023), arXiv:2305.04959. DOI: 10.48550/arXiv.2305.04959. arXiv: 2305.04959 [astro-ph.CO].
- [2] Tsang Keung Chan et al. “Simulations of the reionization of the clumpy intergalactic medium with a novel particle-based two-moment radiative transfer scheme”. In: *The Predictive Power of Computational Astrophysics as a Discover Tool*. Ed. by Dmitry Bisikalo, Dmitri Wiebe, and Christian Boily. Vol. 362. Jan. 2023, pp. 15–20. DOI: 10.1017/S1743921322001235.
- [3] T. K. Chan et al. “The impact of cosmic rays on dynamical balance and disc-halo interaction in L $\star$  disc galaxies”. In: *MNRAS* 517.1 (Nov. 2022), pp. 597–615. DOI: 10.1093/mnras/stac2236. arXiv: 2110.06231 [astro-ph.GA].
- [4] 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].
- [5] T. K. Chan et al. “Cosmic ray feedback in the FIRE simulations: constraining cosmic ray propagation with GeV  $\gamma$ -ray emission”. In: *MNRAS* 488.3 (Sept. 2019), pp. 3716–3744. DOI: 10.1093/mnras/stz1895. arXiv: 1812.10496 [astro-ph.GA].

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<sup>1</sup>[https://www.youtube.com/watch?v=p3\\_o00BD-7Y&list=FLtYC4IcLrlu3-levn1W-1yw&index=2](https://www.youtube.com/watch?v=p3_o00BD-7Y&list=FLtYC4IcLrlu3-levn1W-1yw&index=2)

<sup>2</sup>Full list can be found in <https://ui.adsabs.harvard.edu/search/q=orcid%3A0000-0003-2544-054X&sort=date+desc>

- [6] T. K. Chan et al. “The origin of ultra diffuse galaxies: stellar feedback and quenching”. In: *MNRAS* 478.1 (July 2018), pp. 906–925. DOI: 10.1093/mnras/sty1153. arXiv: 1711.04788 [astro-ph.GA].
- [7] T. K. Chan, AtMa 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].
- [8] 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* 454.3 (Dec. 2015), pp. 2981–3001. DOI: 10.1093/mnras/stv2165. arXiv: 1507.02282 [astro-ph.GA].
- [9] T. K. Chan, AtMa 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].
- [10] 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] Matthieu Schaller et al. “Swift: A modern highly-parallel gravity and smoothed particle hydrodynamics solver for astrophysical and cosmological applications”. In: *arXiv e-prints*, arXiv:2305.13380 (May 2023), arXiv:2305.13380. DOI: 10.48550/arXiv.2305.13380. arXiv: 2305.13380 [astro-ph.IM].
- [2] Andrew Wetzel et al. “Public Data Release of the FIRE-2 Cosmological Zoom-in Simulations of Galaxy Formation”. In: *ApJS* 265.2, 44 (Apr. 2023), p. 44. DOI: 10.3847/1538-4365/acb99a. arXiv: 2202.06969 [astro-ph.GA].
- [3] Zachary Hafen et al. “Hot-mode accretion and the physics of thin-disc galaxy formation”. In: *MNRAS* 514.4 (Aug. 2022), pp. 5056–5073. DOI: 10.1093/mnras/stac1603. arXiv: 2201.07235 [astro-ph.GA].
- [4] Erin Kado-Fong et al. “The In Situ Origins of Dwarf Stellar Outskirts in FIRE-2”. In: *ApJ* 931.2, 152 (June 2022), p. 152. DOI: 10.3847/1538-4357/ac6c88. arXiv: 2109.05034 [astro-ph.GA].
- [5] Cameron W. Trapp et al. “Gas infall and radial transport in cosmological simulations of milky way-mass discs”. In: *MNRAS* 509.3 (Jan. 2022), pp. 4149–4170. DOI: 10.1093/mnras/stab3251. arXiv: 2105.11472 [astro-ph.GA].
- [6] Kung-Yi Su et al. “Which AGN jets quench star formation in massive galaxies?” In: *MNRAS* 507.1 (Oct. 2021), pp. 175–204. DOI: 10.1093/mnras/stab2021. arXiv: 2102.02206 [astro-ph.GA].
- [7] 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].
- [8] 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. arXiv: 2006.13976 [astro-ph.GA].

- [9] 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].
- [10] 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].
- [11] 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].
- [12] 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].
- [13] Alexandres Lazar et al. “A dark matter profile to model diverse feedback-induced core sizes of  $\Lambda$ CDM haloes”. In: *MNRAS* 497.2 (Sept. 2020), pp. 2393–2417. DOI: 10.1093/mnras/staa2101. arXiv: 2004.10817 [astro-ph.GA].
- [14] 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].
- [15] Adam Smercina et al. *A Benchmark Survey of Resolved Stellar Populations in the Nearest Ultra Diffuse Galaxy, F8D1*. HST Proposal. Cycle 28, ID. #16191. May 2020.
- [16] Zachary Hafen et al. “The fates of the circumgalactic medium in the FIRE simulations”. In: *MNRAS* 494.3 (May 2020), pp. 3581–3595. DOI: 10.1093/mnras/staa902. arXiv: 1910.01123 [astro-ph.GA].
- [17] 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].
- [18] 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].
- [19] 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].
- [20] 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].
- [21] 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].
- [22] 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].

- [23] Robyn E. Sanderson et al. “Reconciling Observed and Simulated Stellar Halo Masses”. In: *ApJ* 869.1, 12 (Dec. 2018), p. 12. DOI: 10.3847/1538-4357/aaeb33. arXiv: 1712.05808 [astro-ph.GA].
- [24] Philip F. Hopkins et al. “FIRE-2 simulations: physics versus numerics in galaxy formation”. In: *MNRAS* 480.1 (Oct. 2018), pp. 800–863. DOI: 10.1093/mnras/sty1690. arXiv: 1702.06148 [astro-ph.GA].
- [25] Matthew E. Orr et al. “What FIREs up star formation: the emergence of the Kennicutt-Schmidt law from feedback”. In: *MNRAS* 478.3 (Aug. 2018), pp. 3653–3673. DOI: 10.1093/mnras/sty1241. arXiv: 1701.01788 [astro-ph.GA].
- [26] Kareem El-Badry et al. “Gas kinematics in FIRE simulated galaxies compared to spatially unresolved H I observations”. In: *MNRAS* 477.2 (June 2018), pp. 1536–1548. DOI: 10.1093/mnras/sty730. arXiv: 1801.03933 [astro-ph.GA].
- [27] Freeke van de Voort et al. “On the deuterium abundance and the importance of stellar mass loss in the interstellar and intergalactic medium”. In: *MNRAS* 477.1 (June 2018), pp. 80–92. DOI: 10.1093/mnras/sty591. arXiv: 1704.08254 [astro-ph.GA].
- [28] 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].
- [29] Matthew E. Orr et al. “Stacked Star Formation Rate Profiles of Bursty Galaxies Exhibit  $\alpha$ Coherent Star Formation”. In: *ApJL* 849.1, L2 (Nov. 2017), p. L2. DOI: 10.3847/2041-8213/aa8f93. arXiv: 1709.10099 [astro-ph.GA].
- [30] Zachary Hafen et al. “Low-redshift Lyman limit systems as diagnostics of cosmological inflows and outflows”. In: *MNRAS* 469.2 (Aug. 2017), pp. 2292–2304. DOI: 10.1093/mnras/stx952. arXiv: 1608.05712 [astro-ph.GA].
- [31] Alexander L. Muratov et al. “Metal flows of the circumgalactic medium, and the metal budget in galactic haloes”. In: *MNRAS* 468.4 (July 2017), pp. 4170–4188. DOI: 10.1093/mnras/stx667. arXiv: 1606.09252 [astro-ph.GA].
- [32] Kenny L. S. Yip, T. K. Chan, and P. T. Leung. “Perturbative solution to the Lane-Emden equation: an eigenvalue approach”. In: *MNRAS* 465.4 (Mar. 2017), pp. 4265–4280. DOI: 10.1093/mnras/stw3041. arXiv: 1611.07202 [astro-ph.SR].
- [33] Kareem 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* 835.2, 193 (Feb. 2017), p. 193. DOI: 10.3847/1538-4357/835/2/193. arXiv: 1610.04232 [astro-ph.GA].
- [34] Freeke 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* 463.4 (Dec. 2016), pp. 4533–4544. DOI: 10.1093/mnras/stw2322. arXiv: 1604.01397 [astro-ph.GA].
- [35] Kareem El-Badry et al. “Breathing FIRE: How Stellar Feedback Drives Radial Migration, Rapid Size Fluctuations, and Population Gradients in Low-mass Galaxies”. In: *ApJ* 820.2, 131 (Apr. 2016), p. 131. DOI: 10.3847/0004-637X/820/2/131. arXiv: 1512.01235 [astro-ph.GA].

- [36] Y. -H. Sham et al. “Unveiling the Universality of I-Love-Q Relations”. In: *ApJ* 798.2, 121 (Jan. 2015), p. 121. DOI: 10.1088/0004-637X/798/2/121. arXiv: 1410.8271 [gr-qc].
- [37] Y. J. Zhang et al. “Separation of space-time and matter in polar oscillations of compact stars”. In: *MNRAS* 438.4 (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

### Presentations

#### *Talks*

- *Talk* at Department of Physics Seminar 2022  
The Chinese University of Hong Kong, Hong Kong
- *Invited Talk* at Friday Astronomy Colloquium 2021  
University of Sussex, United Kingdom
- *Invited Talk* at UT Austin extragalactic and cosmology series 2021  
at University of Texas at Austin, United States
- *Talk* at National Astronomy Meeting 2021  
University of Bath, United Kingdom
- *Talk* at SAZERAC 2.0 2021  
Online
- *Talk* at Durham-Edinburgh Extragalactic Workshop XVII 2021  
at Durham University, Durham, United Kingdom
- *Talk* at VIRGO meeting 2020  
at Durham University, Durham, United Kingdom
- *Talk* at Durham-Edinburgh Extragalactic Workshop XVI 2020  
at Durham University, Durham, United Kingdom
- *Invited Talk* at CCAPP seminar 2019  
at CCAPP, Ohio State University, Ohio, United States
- *Invited Talk* at “*The Bewildering Nature of Ultra-diffuse Galaxies*” 2018  
workshop  
at Lorentz Center, Leiden, Netherlands
- *Talk* at ITC “*Galaxies and Cosmology*” seminar 2018  
at ITC, Harvard University, Cambridge, United States
- *Talk* at SFIR seminar 2018  
at Princeton University, New Jersey, United States
- Santa Cruz workshop on galaxy formation 2015,2017,2018  
at University of California at Santa Cruz, United States
- Santa Cruz workshop on galaxy formation 2015,2017,2018

- at University of California at Santa Cruz, United States
- Galaxy Formation and Evolution in Southern California 2017  
at California institute of technology, Pasadena, United States
  - 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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