Tsang Keung Chan: CURRICULUM VITAE

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Work Experience

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

Education

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

- Early Career Scheme, University Grants Committee, Hong Kong 2024
  "Simulating dark matter and gas in the epoch of reionization at high resolutions"
- Direct Grant, Chinese University of Hong Kong 2024
- 'Improvement on Competitiveness in Hiring New Faculties' Funding Scheme, Chinese University of Hong Kong 2023
- 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

- Teaching Lecture UGEB2411B *"A Short Introduction to Astronomy"* 2023-24
- 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

- Hai-Na Huang *"Dark Matter Halos"* at CUHK 2023
- Jian-Hao Wi *"Dark Matter Halos"* at CUHK 2023
- 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

- Talk at Po Leung Kuk Mrs. Ma Kam Ming-Cheung Fook Sien College 2024
- Public Talk at *Continuing Education and College Health and Science Lectures* 2023
- Introductory Video[1] 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 [2].

First Author

[1] Tsang Keung Chan et al. "The impact and response of mini-haloes and the interhalo medium on cosmic reionization". In: *MNRAS* 528.2 (Feb. 2024), pp. 1296–1326. DOI: 10.1093/mnras/stae114. 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.

[1] https://www.youtube.com/watch?v=p3_oO0BD-7Y&list=FLtYC4IcLrlu3-levnlW-1yw&index=2

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

[3] T. K. Chan et al. "The impact of cosmic rays on dynamical balance and disc-halo interaction in L⋆ 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 γ-ray emission". In: *MNRAS* 488.3 (Sept. 2019), pp. 3716–3744. DOI: 10.1093/mnras/stz1895. arXiv: 1812.10496 [astro-ph.GA].

[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 ∼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 ΛCDM 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].

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[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].

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[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 ıCoherentȷ 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

- *Invited Talk* at Department of Physics Seminar 2022
  Hong Kong University, Hong Kong
- *Invited Talk* at "Resolving galaxy ecosystems across all scales" conference 2023
  The Chinese University of Hong Kong, Hong Kong
- *Invited Talk* at The Cosmic Frontiers workshop: Multimessenger Astronomy at Hong Kong 2023
- *Invited Talk* at The International Symposium on Cosmology and Particle Astrophysics 2023
  The Chinese University of Hong Kong, Hong Kong
- *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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