

# Curriculum Vitae – Chang-Goo Kim

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## Education

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Mar 2005– **Ph. D in Astronomy**, Advisor: Prof. Woong-Tae Kim  
Feb 2011 Department of Physics and Astronomy, Seoul National University (SNU), Korea  
Mar 2001– **B. S in Astronomy**  
Feb 2005 Department of Physics and Astronomy, Seoul National University, Korea

## Current Position

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Sep 2016 – **Associate Research Scholar**  
Department of Astrophysical Sciences, Princeton University

## Employment

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Sep 2017 – **Flatiron Research Fellow**  
Aug 2018 Center for Computational Astrophysics (CCA), Flatiron Institute  
Sep 2013 – **Postdoctoral Research Associate**  
Aug 2016 Department of Astrophysical Sciences, Princeton University  
Oct 2011 – **CITA National Fellow**  
Aug 2013 Department of Physics and Astronomy, University of Western Ontario, Canada  
Mar 2011 – **BK21 Postdoctoral Research Fellow**  
Aug 2011 Department of Physics and Astronomy, Seoul National University, Korea

## Teaching Experience

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2021 **Bootcamp Lecturer**, Undergraduate Summer Research Program at Princeton University  
2005 – 2010 **Graduate Student Instructor (Teaching Assistant)**, Seoul National University  
- Grading problem sets and leading problem-solving sessions for courses including *Solar System Astronomy and Lab.*, *Astronomical Observation & Lab. I & II*, *Astronomy and Lab.*, *Introduction to Astrophysics I & II*, *Stars and Stellar Systems*, *Man & the Universe*.  
- Designing and leading the Lab class for Introduction to Astronomy  
- Teaching scientific computing and numerical analysis – root-finding, numerical integration, linear algebra, linear regression

## Research Advisor

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2016 – *present* **PhD thesis projects; 5 papers published**  
Sanghyuk Moon (SNU, current), Lachlan Lancaster (Princeton, current), Woorak Choi (Yonsei, current), Alwin Mao (Princeton, PhD in 2020), Munan Gong (Princeton, PhD in 2017)  
2018 – *present* **Semester/summer projects for graduate students; 3 papers published**  
Nora Linzer (Princeton, current), Erin Kado-Fong (Princeton, 2018), Aditi Vijayan (CCA via [KSPA](#), 2018), Kareem El-Badry (CCA via [KSPA](#), 2018)

2014 – *present* **Junior/senior/summer projects for undergraduate students; 1 paper published**  
Ish Kaul (Princeton, current), Ryan Golant (Princeton, 2019), Mohammad Refat (CCA via [AstroCom NYC](#), 2018), Roberta Raileanu (Princeton, 2014)

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### Grants

2021 **PI**, NASA Astrophysics Theory Program; \$415,564 (submitted)  
2019 **PI**, Chandra cycle 21 Theory; \$85,000  
2018–2021 **Co-I**, NASA TCAN (PI: Julian Borrill); \$1,398,099

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### Observing Proposals

2019 **Co-I**, VLA Extra Large proposal (PI: Adam Leroy); LGLBS  
2019 **Co-I**, VLA Regular proposal (PI: Woorak Choi), 7.4 hours, rank B

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### Computing Time Allocations

2022–2024 **15M CPU hrs (540k SBUs), PI**, NASA HECC (submitted)  
2018–2021 **80M CPU hrs, Co-I**, NERSC, (PI: Julian Borrill)  
2016–2021 **24M CPU hrs (850k SBUs), Co-I**, NASA HECC, (PI: Eve Ostriker)

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### Professional Activities and Service

2017 – 2022 **Working Group Leader, SMAUG (Simulating Multiscale Astrophysics to Understand Galaxies) collaboration**  
leading the working group for “Resolved ISM, Star formation, and Stellar feedback”  
2018 – 2021 **Subnet Leader**, NASA Theoretical and Computational Astrophysics Networks  
leading the MHD simulation subnet in the multi-institutional collaboration funded by NASA entitled “Modeling Polarized Galactic Foregrounds for CMB Missions”  
2021 – **Working Group Member, LGLBS**  
21-cm line and L-band continuum emission over the full area of the six actively star-forming Local Group galaxies using 1800 hours of “L band” (1-2 GHz) observations in all VLA configurations  
2020 – **HI Working Group Member, GASKAP**  
high spectral resolution survey of the HI and OH lines in the Milky Way and Magellanic Systems  
2019 – 2020 **Working Group Member, SPICA Nearby Galaxies**  
member of the SPICA science case development team for “Diffuse gas in galaxies”  
2017 – 2019 **Working Group Member, PICO collaboration**  
contributing galactic foreground modeling for a probe-class mission concept study funded by NASA entitled “Probe of Inflation and Cosmic Origins”  
2020, 2021 **Reviewer**, NASA FINESST  
2017 **Review Panelist**, NSF AAG Program  
2016 – 2017 **Organizer**, Star Formation/ISM Rendezvous Seminars at Princeton University  
2012 – **Referee**, ApJ, ApJL, MNRAS, JOSS

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### Invited Reviews

2019 **Invited Review**, [Cosmic turbulence and magnetic fields: physics of baryonic matter across time and scales](#), Cargèse, France  
2019 **Invited Review**, [Linking galaxies from the Epoch of initial star-formation to today](#), Sydney, Australia

2016 **Invited Review**, [How Galaxies Form Stars](#), Stockholm, Sweden

### Invited Colloquia

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2020 **Colloquium**, University of Georgia, Athens, GA – remote talk  
2020 **Colloquium**, University of Waterloo, Waterloo, ON, Canada  
2019 **Colloquium**, University of Maryland, College Park, MD  
2019 **Colloquium**, Australia National University, Canberra, Australia  
2018 **Colloquium**, Yonsei University, Seoul, Korea  
2018 **Colloquium**, Korea Astronomy and Space Science Institute, Daejeon, Korea  
2017 **Colloquium**, Osaka University, Osaka, Japan  
2017 **Colloquium**, University of California, Santa Barbara, CA  
2016 **Colloquium**, Shanghai Jiao Tong University, Shanghai, China  
2016 **Colloquium**, Korea Astronomy and Space Science Institute, Daejeon, Korea  
2016 **Colloquium**, Seoul National University, Seoul, Korea  
2014 **Colloquium**, Korea Astronomy and Space Science Institute, Daejeon, Korea  
2014 **Colloquium**, Seoul National University, Seoul, Korea  
2014 **Colloquium**, Korea Institute for Advanced Study, Seoul, Korea  
2011 **Colloquium**, National Institute for Mathematical Sciences, Daejeon, Korea  
2011 **Colloquium**, Yonsei University, Seoul, Korea

### Conference/Workshop/Seminar

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2021 **Invited Talk**, Midwest Magnetic Field Meeting 2021, Madison, WI (remote)  
2020 **Invited Talk**, [CMB-S4 Workshop](#), UChicago (remote)  
2020 **Invited Talk**, [Cosmological Analyses Featuring Galactic Foreground Emission](#), Lattes, France – cancelled due to the pandemic  
2019 **Contributed Talk**, Feedback and its Role in Galaxy Formation, Spetses, Greece  
2019 **Poster**, Linking the Milky Way and Nearby Galaxies, Helsinki, Finland  
2019 **Invited Talk**, Multi-phase Gas Workshop, CCA, New York, NY  
2019 **Invited Talk**, Athena++ Workshop 2019, UNLV, Las Vegas, NV  
2018 **Contributed Talk**, THINKSHOP15, Potsdam, Germany  
2018 **Invited Talk**, The Milky Way in the age of Gaia, Orsay, France  
2018 **Invited Talk**, Kavli Summer Program in Astrophysics, CCA, New York, NY  
2018 **Invited Talk**, MPPC Workshop, Princeton, NJ  
2018 **Invited Talk**, CMB Foreground Workshop at CCA, New York, NY  
2018 **Invited Talk**, Computational Galaxy Formation at Ringberg Castle, Germany  
2017 **Invited Talk**, CMB Foreground Workshop at UCSD, San Diego, CA  
2017 **Invited Talk**, The ISM beyond 3D, Orsay, France  
2017 **Invited Talk**, Astrophysics Seminar, UCSB, Santa Barbara, CA  
2016 **Invited Talk**, 7th East-Asia Numerical Astrophysics Meeting, Beijing, China  
2016 **Invited Talk**, Computational Galaxy Formation at Ringberg Castle, Germany  
2015 **Contributed Talk**, Magnetic Fields in the Universe V, Cargèse, France

2015           **Contributed Talk**, IAU Symposium #315, Honolulu, HI  
2015           **Invited Talk**, IAS Informal Seminar, IAS, Princeton, NJ  
2014           **Invited Talk**, 6th East-Asia Numerical Astrophysics Meeting, Suwon, Korea  
2014           **Invited Talk**, KITP Program – Gravity’s Loyal Opposition, Santa Barbara, CA  
2013           **Invited Talk**, CITA National Fellow Meeting, Toronto, Canada  
2013           **Contributed Talk**, KAS Spring Meeting, Daecheon, Korea  
2012           **Invited Talk**, IAU General Assembly – SpS12, Beijing, China  
2012           **Contributed Talk**, AAS Meeting #221, Long Beach, CA

## References

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- **Eve C. Ostriker**  
[eco@astro.princeton.edu](mailto:eco@astro.princeton.edu), +1-609-258-7240  
Professor, Department of Astrophysical Sciences, Princeton University
- **Rachel S. Somerville**  
[rsomerville@flatironinstitute.org](mailto:rsomerville@flatironinstitute.org), +1-848-445-8964  
Group Leader, Center for Computational Astrophysics, Flatiron Institute
- **Greg L. Bryan** (co-sign with Prof. Somerville)  
[gbryan@astro.columbia.edu](mailto:gbryan@astro.columbia.edu), +1-212-854-6837  
Professor, Department of Astronomy, Columbia University
- **James M. Stone**  
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Professor, School of Natural Sciences, Institute for Advanced Study
- **Woong-Tae Kim**  
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Professor, Department of Physics and Astronomy, Seoul National University
- **Amiel Sternberg**  
[amiel@astro.tau.ac.il](mailto:amiel@astro.tau.ac.il), 03-6407590  
Professor, Department of Astronomy, Tel Aviv University
- **Raphael Flauger**  
[flauger@physics.ucsd.edu](mailto:flauger@physics.ucsd.edu), +1-858-534-7504  
Professor, Department of Physics, University of California, San Diego

## List of Publications (ADS, Google Scholar)

Name: student advised/co-advised by me

Publication metrics (based on NASA ADS, as of 2021-09-30):

refereed: 34 — citations: 1289 — h-index: 17

### Refereed Publications (first author papers: 15 — citations: 1012 — h-index: 13) \_\_\_\_\_

34. **Kim, Chang-Goo**; Ostriker, Eve C.; Fielding, Drummond B.; Smith, Matthew C. *et al.*, *A Framework for Multiphase Galactic Wind Launching Using TIGRESS*, *ApJ*, **903**, 2020 (arXiv:2010.09090) [6 citations]
33. **Kim, Chang-Goo**; Ostriker, Eve C.; Somerville, Rachel S.; Bryan, Greg L. *et al.*, *First Results from SMAUG: Characterization of Multiphase Galactic Outflows from a Suite of Local Star-forming Galactic Disk Simulations*, *ApJ*, **900**, 61, 2020 (arXiv:2006.16315) [21 citations]
32. **Kim, Chang-Goo**; Choi, Steve K.; Flauger, Raphael, *Dust Polarization Maps from TIGRESS: E/B Power Asymmetry and TE Correlation*, *ApJ*, **880**, 106, 2019 (arXiv:1901.07079) [15 citations]
31. **Kim, Chang-Goo**; Ostriker, Eve C., *Numerical Simulations of Multiphase Winds and Fountains from Star-forming Galactic Disks. I. Solar Neighborhood TIGRESS Model*, *ApJ*, **853**, 173, 2018 (arXiv:1801.03952) [96 citations]
30. **Kim, Chang-Goo**; Ostriker, Eve C., *Three-phase Interstellar Medium in Galaxies Resolving Evolution with Star Formation and Supernova Feedback (TIGRESS): Algorithms, Fiducial Model, and Convergence*, *ApJ*, **846**, 133, 2017 (arXiv:1612.03918) [85 citations]
29. **Kim, Chang-Goo**; Ostriker, Eve C.; Raileanu, Roberta, *Superbubbles in the Multiphase ISM and the Loading of Galactic Winds*, *ApJ*, **834**, 25, 2017 (arXiv:1610.03092) [83 citations]
28. **Kim, Chang-Goo**; Ostriker, Eve C., *Vertical Equilibrium, Energetics, and Star Formation Rates in Magnetized Galactic Disks Regulated by Momentum Feedback from Supernovae*, *ApJ*, **815**, 67, 2015 (arXiv:1511.00010) [69 citations]
27. **Kim, Chang-Goo**; Ostriker, Eve C., *Momentum Injection by Supernovae in the Interstellar Medium*, *ApJ*, **802**, 99, 2015 (arXiv:1410.1537) [224 citations]
26. **Kim, Chang-Goo**; Ostriker, Eve C.; Kim, Woong-Tae, *Three-dimensional Hydrodynamic Simulations of Multiphase Galactic Disks with Star Formation Feedback. II. Synthetic H I 21 cm Line Observations*, *ApJ*, **786**, 64, 2014 (arXiv:1403.5566) [41 citations]
25. **Kim, Chang-Goo**; Basu, Shantanu, *Long-term Evolution of Decaying Magnetohydrodynamic Turbulence in the Multiphase Interstellar Medium*, *ApJ*, **778**, 88, 2013 (arXiv:1309.4996) [4 citations]
24. **Kim, Chang-Goo**; Ostriker, Eve C.; Kim, Woong-Tae, *Three-dimensional Hydrodynamic Simulations of Multiphase Galactic Disks with Star Formation Feedback. I. Regulation of Star Formation Rates*, *ApJ*, **776**, 1, 2013 (arXiv:1308.3231) [146 citations]
23. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Regulation of Star Formation Rates in Multiphase Galactic Disks: Numerical Tests of the Thermal/Dynamical Equilibrium Model*, *ApJ*, **743**, 25, 2011 (arXiv:1109.0028) [115 citations]
22. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Galactic Spiral Shocks with Thermal Instability in Vertically Stratified Galactic Disks*, *ApJ*, **720**, 1454, 2010 (arXiv:1006.4691) [17 citations]
21. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Galactic Spiral Shocks with Thermal Instability*, *ApJ*, **681**, 1148, 2008 (arXiv:0804.0139) [48 citations]

20. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Interstellar Turbulence Driving by Galactic Spiral Shocks*, ApJ, **649**, 2006 (arXiv:astro-ph/0608161) [42 citations]

#### Refereed Publications (second author/student led)

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19. Clark, S. E.; **Kim, Chang-Goo**; Hill, J. Colin; Hensley, Brandon S., *The Origin of Parity Violation in Polarized Dust Emission and Implications for Cosmic Birefringence*, ApJ, **919**, 53, 2021 (arXiv:2105.00120) [4 citations]
18. Lancaster, Lachlan; Ostriker, Eve C.; Kim, Jeong-Gyu; **Kim, Chang-Goo**, *Efficiently Cooled Stellar Wind Bubbles in Turbulent Clouds. II. Validation of Theory with Hydrodynamic Simulations*, ApJ, **914**, 90, 2021 (arXiv:2104.07722) [6 citations]
17. Lancaster, Lachlan; Ostriker, Eve C.; Kim, Jeong-Gyu; **Kim, Chang-Goo**, *Efficiently Cooled Stellar Wind Bubbles in Turbulent Clouds. I. Fractal Theory and Application to Star-forming Clouds*, ApJ, **914**, 89, 2021 (arXiv:2104.07691) [6 citations]
16. Moon, Sanghyuk; Kim, Woong-Tae; **Kim, Chang-Goo**; Ostriker, Eve C., *Star Formation in Nuclear Rings with the TIGRESS Framework*, ApJ, **914**, 9, 2021 (arXiv:2104.10349)
15. Koo, Bon-Chul; **Kim, Chang-Goo**; Park, Sangwook; Ostriker, Eve C., *Radiative Supernova Remnants and Supernova Feedback*, ApJ, **905**, 35, 2020 (arXiv:2011.06322)
14. Seon, Kwang-il; **Kim, Chang-Goo**, *Ly $\alpha$  Radiative Transfer: Monte Carlo Simulation of the Wouthuysen-Field Effect*, ApJS, **250**, 9, 2020 (arXiv:2005.00238) [7 citations]
13. Mao, S. Alwin; Ostriker, Eve C.; **Kim, Chang-Goo**, *Cloud Properties and Correlations with Star Formation in Self-consistent Simulations of the Multiphase ISM*, ApJ, **898**, 52, 2020 (arXiv:1911.05078) [9 citations]
12. Kim, Woong-Tae; **Kim, Chang-Goo**; Ostriker, Eve C., *Local Simulations of Spiral Galaxies with the TIGRESS Framework. I. Star Formation and Arm Spurs/Feathers*, ApJ, **898**, 35, 2020 (arXiv:2006.05614) [14 citations]
11. Kado-Fong, Erin; Kim, Jeong-Gyu; Ostriker, Eve C.; **Kim, Chang-Goo**, *Diffuse Ionized Gas in Simulations of Multiphase, Star-forming Galactic Disks*, ApJ, **897**, 143, 2020 (arXiv:2006.06697) [5 citations]
10. Vijayan, Aditi; **Kim, Chang-Goo**; Armillotta, Lucia; Ostriker, Eve C. *et al.*, *Kinematics and Dynamics of Multiphase Outflows in Simulations of the Star-forming Galactic Interstellar Medium*, ApJ, **894**, 12, 2020 (arXiv:1911.07872) [11 citations]
9. El-Badry, Kareem; Ostriker, Eve C.; **Kim, Chang-Goo**; Quataert, Eliot *et al.*, *Evolution of supernovae-driven superbubbles with conduction and cooling*, MNRAS, **490**, 1961, 2019 (arXiv:1902.09547) [25 citations]

#### Refereed Publications (co-author)

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8. Pandya, V. *et al.* (incl. **CGK**; 11/13), *First Results from SMAUG: The Need for Preventative Stellar Feedback and Improved Baryon Cycling in Semianalytic Models of Galaxy Formation*, ApJ, **905**, 4, 2020 (arXiv:2006.16317) [13 citations]
7. Gong, Munan; Ostriker, Eve C.; **Kim, Chang-Goo**; Kim, Jeong-Gyu, *The Environmental Dependence of the X<sub>CO</sub> Conversion Factor*, ApJ, **903**, 142, 2020 (arXiv:2009.14631) [11 citations]
6. Fielding, D. B. *et al.* (incl. **CGK**; 7/15), *First Results from SMAUG: Uncovering the Origin of the Multiphase Circumgalactic Medium with a Comparative Analysis of Idealized and Cosmological Simulations*, ApJ, **903**, 32, 2020 (arXiv:2006.16316) [18 citations]

5. Murray, Claire E.; Peek, J. E. G.; **Kim, Chang-Goo**, *Extracting the Cold Neutral Medium from H I Emission with Deep Learning: Implications for Galactic Foregrounds at High Latitude*, *ApJ*, **899**, 15, 2020 (arXiv:2006.16490) [8 citations]
4. Murray, C. E. *et al.* (incl. **CGK**; 7/7), *The 21-SPONGE H I Absorption Line Survey. I. The Temperature of Galactic H I*, *ApJS*, **238**, 14, 2018 (arXiv:1806.06065) [37 citations]
3. Gong, Munan; Ostriker, Eve C.; **Kim, Chang-Goo**, *The  $X_{CO}$  Conversion Factor from Galactic Multiphase ISM Simulations*, *ApJ*, **858**, 16, 2018 (arXiv:1803.09822) [34 citations]
2. Murray, Claire E.; Stanimirović, Snežana; **Kim, Chang-Goo**; Ostriker, Eve C. *et al.*, *Recovering Interstellar Gas Properties with Hi Spectral Lines: A Comparison between Synthetic Spectra and 21-SPONGE*, *ApJ*, **837**, 55, 2017 (arXiv:1612.02017) [20 citations]
1. Safraneck-Shrader, Chalence; Krumholz, Mark R.; **Kim, Chang-Goo**; Ostriker, Eve C. *et al.*, *Chemistry and radiative shielding in star-forming galactic discs*, *MNRAS*, **465**, 885, 2017 (arXiv:1605.07618) [35 citations]

### Papers under Review

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- Pandya, V. *et al.* (incl. **CGK**; 8/17), *Characterizing mass, momentum, energy and metal outflow rates of multi-phase galactic winds in the FIRE-2 cosmological simulations*, 2021 (arXiv:2103.06891) [7 citations]
- Motwani, Bhawna; Genel, Shy; Bryan, Greg L.; **Kim, Chang-Goo** *et al.*, *First results from SMAUG: Insights into star formation conditions from spatially-resolved ISM properties in TNG50*, 2020 (arXiv:2006.16314) [6 citations]

### Conference Proceedings

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- **Kim, Chang-Goo**; Ostriker, Eve C., 2016 (arXiv:1511.00018), In P. Jablonka, P. André, and F. van der Tak, editors, *From Interstellar Clouds to Star-Forming Galaxies: Universal Processes?*, volume 315 of *IAU Symposium*, pages 38–41, *Feedback Regulated Turbulence, Magnetic Fields, and Star Formation Rates in Galactic Disks*.
- **Kim, Chang-Goo**; Ostriker, Eve C.; Kim, Woong-Tae, 2015 (arXiv:1211.5161), Highlights of Astronomy, 16:609–610, March 2015, *Numerical modeling of multiphase, turbulent galactic disks with star formation feedback*.