

# Curriculum Vitae – Chang-Goo Kim

Department of Astrophysical Sciences  
Princeton University  
4 Ivy Lane, Princeton  
NJ 08544, USA

+1-609-933-1180  
<http://changgoo.github.io>  
ORCID: 0000-0003-2896-3725  
[cgkim@astro.princeton.edu](mailto:cgkim@astro.princeton.edu)

## 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, 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 2018 – **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 2016 – **Associate Research Scholar**  
Aug 2017 Department of Astrophysical Sciences, Princeton University  
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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2019 – *present* **Sanghyuk Moon**, Graduate student at Seoul National University  
*Star Formation in Galactic Nuclear Rings* – Ph. D. thesis project (with Woong-Tae Kim and Eve Ostriker)  
2019 – *present* **Lachlan Lancaster**, Graduate student at Princeton University  
*Globular Cluster Formation in Giant Molecular Clouds* – Ph. D. thesis project (with Jeong-Gyu Kim and Eve Ostriker)  
2017 – *present* **Woorak Choi**, Graduate student at Yonsei University  
*Ram pressure stripping in resolved multiphase ISM simulations* – Ph.D thesis project (with Aeree Chung)  
2019 – 2020 **Ryan Golant**, Undergraduate student at Princeton University  
*Effect of early feedback in regulating star formation rates* – Summer research, Senior thesis (with Eve Ostriker)  
2018 – 2020 **Alwin Mao**, Graduate student at Princeton University  
*Bound gas, Dense gas, and Star Formation: a Deceptively Simple Braid* – Ph. D. thesis project (with Eve Ostriker)  
2018 – 2019 **Erin Kado-Fong**, Graduate student at Princeton University  
*Diffuse ionized gas in star-forming galactic disks* – Semester project (with Jeong-Gyu Kim and Eve Ostriker)

- 2018 – 2019 **Aditi Vijayan**, Graduate student at the Indian Institute of Science  
*Kinematics and dynamics of multiphase outflows* – Summer research via [Kavli Summer Program in Astrophysics](#) (with Lucia Armillotta, Eve Ostriker, Miao Li)
- 2018 – 2019 **Kareem El-Badry**, Graduate student at the UC Berkeley  
*Evolution of supernovae-driven superbubbles with conduction and cooling* – Summer research via [Kavli Summer Program in Astrophysics](#) (with Eve Ostriker)
- 2018 **Mohammad Refat**, Undergraduate student at the CUNY  
*Metallicity fluctuations in TIGRESS* – Summer research via [AstroCom NYC](#)
- 2018 – 2019 **Erin Flowers**, Graduate student at Princeton University  
*Turbulence driving and outflows by clustered Supernovae* – Semester project (with Eve Ostriker)
- 2014 – 2015 **Roberta Raileanu**, Undergraduate student at Princeton University  
*Superbubbles in the multiphase ISM and the loading of galactic winds* – Junior Thesis and Summer research (with Eve Ostriker)
- 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 programming languages and analysis tools including Fortran, C, and IDL.
  - Teaching scientific computing and numerical analysis – root-finding, numerical integration, linear algebra, linear regression

## Grants

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- 2020 **PI**, Chandra Theory Grant; \$85,000
- 2018–2021 **Co-I**, NASA TCAN (PI: Julian Borrill); \$1,398,099

## Observing Proposals

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

## Computing Time Allocations

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- 2018–2021 **80M CPU hrs, Co-I**, NERSC, (PI: Julian Borrill)
- 2016–2019 **22M CPU hrs (800k SBUs), Co-I**, NASA Pleiades, (PI: Eve Ostriker)

## Professional Activities and Service

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- 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” in the international collaboration funded by the Simons Foundation
- 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”
- 2020 – **HI Working Group Member, GASKAP**  
high spectral resolution survey of the HI and OH lines in the Milky Way and Magellanic Systems

2019 – **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 **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

#### Invited Reviews

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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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2020 **Invited Talk**, [CMB-S4 Workshop](#), UChicago – remote talk

2020 **Invited Talk**, Midwest Magnetic Field Meeting 2020, Madison, WI – cancelled due to the pandemic

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, Carg  se, 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** (co-sign with Prof. Bryan)  
[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  
 Group Leader, Center for Computational Astrophysics, Flatiron Institute  
 Professor, Department of Astronomy, Columbia University
- **James M. Stone**  
[jmstone@ias.edu](mailto:jmstone@ias.edu), +1-609-734-8054  
 Professor, School of Natural Sciences, Institute for Advanced Study
- **Raphael Flauger** (cosmological implications)  
[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 2021-04-01):

refereed: 30 — citations: 1123 — h-index: 16

**Refereed Publications (first author papers: 15 — citations: 923 — h-index: 12)** \_\_\_\_\_

30. **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) [3 citations]
29. **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) [16 citations]
28. **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) [12 citations]
27. **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) [85 citations]
26. **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) [73 citations]
25. **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) [71 citations]
24. **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) [63 citations]
23. **Kim, Chang-Goo**; Ostriker, Eve C., *Momentum Injection by Supernovae in the Interstellar Medium*, ApJ, **802**, 99, 2015 (arXiv:1410.1537) [207 citations]
22. **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) [37 citations]
21. **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]
20. **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) [137 citations]
19. **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) [110 citations]
18. **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]
17. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Galactic Spiral Shocks with Thermal Instability*, ApJ, **681**, 1148, 2008 (arXiv:0804.0139) [47 citations]



16. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Interstellar Turbulence Driving by Galactic Spiral Shocks*, ApJ, **649**, 2006 (arXiv:astro-ph/0608161) [41 citations]

#### Refereed Publications (second author)

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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) [5 citations]
13. 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) [7 citations]
12. 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) [8 citations]

#### Refereed Publications (co-author)

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11. 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) [10 citations]
10. Gong, Munan; Ostriker, Eve C.; **Kim, Chang-Goo**; Kim, Jeong-Gyu, *The Environmental Dependence of the  $X_{CO}$  Conversion Factor*, ApJ, **903**, 142, 2020 (arXiv:2009.14631) [8 citations]
9. 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) [13 citations]
8. 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) [6 citations]
7. 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) [7 citations]
6. 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) [3 citations]
5. 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) [21 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) [30 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) [31 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) [16 citations]

1. Safranek-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](#)) [30 citations]

## Papers under Review

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- Clark, S. E.; **Kim, Chang-Goo**; Hill, J. Colin; Hensley, Brandon S. *TB, or not TB? The origin of parity-odd quantities in the Galactic polarized dust emission*, to be submitted
- Moon, Sanghyuk; Kim, Woong-Tae; **Kim, Chang-Goo**; Ostriker, Eve C., *Star Formation in Nuclear Rings with the TIGRESS Framework*, submitted to ApJ (02/2021)
- 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*, submitted to ApJ (12/2020)
- 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*, submitted to ApJ (12/2020)
- 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](#))
- 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](#)) [5 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*.