
Chen Heinrich

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PERSONAL

Nationality Canada

EDUCATION

2012 - 2017 University of Chicago, Chicago, IL, USA
 Ph.D. in Physics
 Advisor: Professor Wayne Hu

2009 - 2012 McGill University, Montreal, QC, Canada
 B.Sc. in Joint Honours Mathematics and Physics
 First-class honours

RESEARCH EXPERIENCE

09/2017 - present Postdoctoral Scholar at JPL/Caltech
 Group: Origin of the Universe

09/2013 - 07/2017 Graduate Student Researcher (with Prof. Wayne Hu)
 Department of Astronomy, University of Chicago

09/2012 - 09/2013 Graduate Student Researcher (with Prof. Dan Hooper)
 Department of Astronomy, University of Chicago

01/2012 - 08/2012 Undergraduate Research Assistant (with Prof. Robert Brandenberger)
 McGill Theoretical Cosmology Group, McGill University

05/2011 - 09/2012 Undergraduate Research Assistant (with Prof. Vicky Kaspi)
 The McGill Pulsar Group, McGill University

RESEARCH INTEREST

Summary

- I work at the intersection of cosmology and fundamental physics, connecting theories to observations of the cosmic microwave background (CMB) and large scale structure (LSS). I'm currently part of the WFIRST high latitude survey team.

Topics

- Early-universe and inflationary physics
- Reionization, gravitational lensing
- Dark energy and modified gravity

- Weak lensing, bispectrum
- Machine learning and convolutional neural network

PUBLICATIONS

- Doré et al. WFIRST Science Investigation Team "Cosmology with the High Latitude Survey" Annual Report 2017. 2018, arxiv:1804.03628
- G. Obied, C. Dvorkin, **C. Heinrich**, W. Hu, V. Miranda. Inflationary vs. reionization features from Planck 2015 data. 2018, arxiv:1803.01858
- **C. Heinrich** & W. Hu. Does Planck 2015 polarization favor high redshift reionization? 2018, arxiv:1802.00791
- G. Obied, C. Dvorkin, **C. Heinrich**, W. Hu, V. Miranda. Inflationary features and shifts in cosmological parameters from Planck 2015 data. 2017, arxiv:1706.09412.
- V. Miranda, A. Lidz, **C. He Heinrich**, W. Hu. CMB signatures of metal-free star formation and Planck 2015 polarization data. 2016, MNRAS Vol. 467, Issue 4.
- **C. He Heinrich**, V. Miranda, W. Hu. Complete reionization constraints from Planck 2015 polarization. 2016, D 95, 023513.
- **C. He Heinrich**, D. Grin, W. Hu. Lensing bias to CMB measurements of compensated isocurvature perturbations. 2016, Phys. Rev. D 94, 043534 (*selected as part of PRD "Kaleidoscope"*).
- V. Miranda, W. Hu, **C. He**, H. Motohashi. Nonlinear excitations in inflationary power spectra. 2016, Physical Review D 93, 023504.
- **C. He**, D. Grin, W. Hu. Compensated isocurvature perturbations in the curvaton model. 2015, Physical Review D 92, 063018.
- **C. He**, K. Bechtol, A.P. Hearin & D. Hooper. Prospects for detecting gamma rays from annihilating dark matter in dwarf galaxies in the era of DES and LSST. 2015, Physical Review D 91, 063515.
- J. Luo, C.-Y. Ng, W. C. G Ho, S. Bogdanov, V. M. Kaspi & **C. He**. Hunting for orphaned central compact objects among radio pulsars. 2015, The Astrophysical Journal 808, 130.
- **C. He**, C.-Y. Ng & V. M. Kaspi. The correlation between dispersion measure and X-ray column density from radio pulsars. 2013, Astrophysical Journal 768, 64.

PRESENTATIONS

TALKS

"Lensing Bias on CMB Polarization Measurements of Compensated Isocurvature Perturbations"

- Kavli CMB Lensing Workshop, Stanford University, Stanford, CA, USA, Sept. 2017

“Complete Reionization Constraints from Planck 2015 Polarization”

- Astrophysics, Gravitation and Cosmology Seminar, UIUC, IL, USA, Feb. 2017
- TAPIR Seminar, Caltech, Pasadena, CA, USA, Oct. 2016
- IMPS Seminar, UC Santa Cruz, Santa Cruz, CA, USA, Oct. 2016
- Cosmology Seminar, Stanford University, Stanford, CA, USA, Oct. 2016
- UC Berkeley, CA, USA, Oct. 2016

“Lensing Bias on CMB Measurements of Compensated Isocurvature Perturbations”

- COSMO-2016, University of Michigan, Ann Arbor, MI, USA, Aug. 2016
- Tea Talk, Stanford University, Stanford, CA, USA, Oct. 2016

“Nonlinear Excitations in Inflationary Power Spectra”.

- WOPAT, Department of Astronomy, University of Chicago, Chicago, IL, USA, 2016

“Compensated Isocurvature Perturbations in the Curvaton Model”.

- Graduate Student Symposium, University of Chicago, Chicago, IL, USA, 2015

“Prospects for Detecting Gamma Rays from Annihilating Dark Matter in Dwarf Galaxies in the Era of DES and LSST”

- Special Seminar in Physics, McGill University, Montreal, QC, Canada, Sept 2013.

Pulsars: Light Houses of Our Universe”

- Undergraduate Students Symposium, McGill University, Montreal, QC, Canada, Jan 2012.

“À La Recherche des Étoiles à Neutrons avec L’Observatoire Chandra”

- Conference SAPM (Astronomers’ Society of the Montreal Planetarium), Montreal, QC, Canada, Nov 2011.

“Searching for Neutron Stars in Disguise with NASA’s Chandra X-Ray Observatory”.

- Conference Women in Physics Canada, Perimeter Institute, Waterloo, ON, Canada, July 2011.

POSTERS

“Searching/Hunting for Neutron Stars in Disguise with NASA’s Chandra X-Ray Observatory”.

- McGill University 7th Annual Undergraduate Research Conference, Montreal, Oct 2011 (*1st place in Physical Sciences category*).
- McGill University Department of Physics Poster Competition, McGill University, Montreal, Oct 2011 (*1st place*).
- 12th HEAD (High Energy Astrophysics Division) Meeting of the American Astronomical Society, 20.11, Sept 2011 (by C.-Y. Ng; in conf. proc.).

“Compensated Isocurvature Perturbations in the Curvaton Model”.

- Conference Essential Cosmology for Next Generations, Mexico, 2016 (*best poster prize*).

“The Correlation Between Dispersion Measure and X-ray Column Density from Radio Pulsars”.

- 13th HEAD (High Energy Astrophysics Division) Meeting of the American Astronomical Society, 126.12, April 2013 (by C.-Y. Ng; in conf. proc.).

COMPUTER SKILLS

Programming languages

- python, Fortran, MATLAB, C, C++.

Cosmology

- CAMB, COSMOMC, LensPix, HEALPIX, Planck likelihood code, CosmoLike, GRASP

Machine learning

- TensorFlow, Keras, PyTorch

Other

- Microsoft Office, LaTeX, Git, CVS.

AWARDS AND DISTINCTIONS

- Conference Essential Cosmology for the Next Generations: *Best Poster Prize* (2016)
- Winstein Travel Award (Dept. of Physics University of Chicago) (2013)
- McGill Annual Undergraduate Research Conference: *1st place in Physical Sciences* (2011)
- McGill Physics Undergraduate Research Poster Competition: *1st place* (2011)
- Opti-Math Competition (All Candian French high schools): *1st place* (2003)
- Opti-Math Competition: *2nd place & Prize for Originality in Problem Solving* (2002)

TEACHING EXPERIENCE

Teaching Assistant, Department of Physics, University of Chicago, Chicago, IL USA

2016 Quantum Field Theory III

2013 – 2014 Intermediate Electricity and Magnetism I & II; Quantum Mechanics.

2012 – 2013 Classical Mechanics; Electricity and Magnetism; Waves, Optics and Heat.

OUTREACH EXPERIENCE

2014 – 2015 **Lead Instructor, Space Explorers Program, University of Chicago**, Chicago, IL, USA

- Designed and taught 25 weekly science enrichment labs (on physics and robotics) for about 20 under-privileged minority high school students in Chicago, as part of a program that supports them to become first-generation college students.
- Led the design and teaching of 2 full-immersion institutes on robotics:
 - 2015 Yerkes Summer Institute: Mission to Mars – The Engineering Design Process (7 days).
 - 2014 Yerkes Winter Institute: Robotics, Telescopes and STEAM (3 days).
- Participated in the design and teaching of:
 - 2014 Yerkes Summer Institute: Renewable Energy (3 days).

2011 **Bilingual Animator, Planetarium of Montreal**, Montreal, QC, Canada

- Narrated multimedia shows in the Planetarium dome in French and English.
- Presented the seasonal night sky and astronomy news.
- Led scientific workshops, observation sessions and supervised exhibitions.

2009 - now **Workshop leader and organizer** of various science outreach events with primary focus on promoting women in science.

REFERENCES

Prof. Wayne Hu

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Prof. Olivier Doré

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Prof. Daniel Grin

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