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# Chen He Heinrich

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## PERSONAL

Nationality            Canada

## EDUCATION

2012 - present            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

09/2013 - present        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       Research Assistant (with Prof. Robert Brandenberger)  
   McGill Theoretical Cosmology Group, McGill University

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

05/2010-09/2010        Research Assistant (with Prof. Matt Dobbs)  
   The McGill Cosmology Instrumentation Laboratory, 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).

### Topics

- Early-universe and inflationary physics
- Dark matter in astrophysics and cosmology
- Dark energy, neutrinos, gravitational waves

## PUBLICATIONS

- V. Miranda, A. Lidz, **C. He Heinrich**, W. Hu. Signatures of metal-free star formation in Planck 2015 polarization data. 2016, arXiv:1610.00691.
- **C. He Heinrich**, V. Miranda, W. Hu. Complete reionization constraints from Planck 2015 polarization. 2016, arXiv:1609.04788.
- **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

#### **"Complete Reionization Constraints from Planck 2015 Polarization"**

- 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 7<sup>th</sup> Annual Undergraduate Research Conference, Montreal, Oct 2011 (*1<sup>st</sup> place in Physical Sciences category*).
- McGill University Department of Physics Poster Competition, McGill University, Montreal, Oct 2011 (*1<sup>st</sup> 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

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

### Cosmology related

- CAMB, COSMOMC, LensPix, HEALPIX, Planck likelihood code, GRASP (antenna pattern simulator).

### Software

- Microsoft Office, LaTeX, CVS, Git.

## 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: *1<sup>st</sup> place in Physical Sciences* (2011)
- McGill Physics Undergraduate Research Poster Competition: *1<sup>st</sup> place* (2011)
- Opti-Math Competition (All Candian French high schools): *1<sup>st</sup> place* (2003)
- Opti-Math Competition: *2<sup>nd</sup> place & Prize for Originality in Problem Solving* (2002)

## HONORS SOCIETY

- Member of Sigma Xi: The Scientific Research Society (2011 – 2015)

## 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 two full-immersion institutes on engineering and 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**

Department of Astronomy and  
Astrophysics  
University of Chicago  
5640 South Ellis Ave.  
Chicago, IL 60637  
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### **Prof. Daniel Grin**

Department of Physics and  
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Haverford College  
370 Lancaster Ave.  
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### **Prof. Dan Hooper**

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