

<b>Contact Information</b>	<a href="#">Dunlap Institute for Astronomy and Astrophysics</a> University of Toronto Astronomy Building, AB 211 50 St. George st. Toronto, ON, M5S 3H4 Canada Canada	<a href="mailto:vernstrom@dunlap.utoronto.ca">vernstrom@dunlap.utoronto.ca</a> <a href="http://www.dunlap.utoronto.ca/~vernstrom">www.dunlap.utoronto.ca/~vernstrom</a>
<b>Research Interests</b>	Extragalactic radio sources, properties and statistics, particularly in the $\mu$ Jy and sub- $\mu$ Jy ranges; source confusion; galaxy evolution; diffuse radio emission; large scale structure; the cosmic radio background; the synchrotron cosmic web; cosmic magnetism; high redshift source properties; radio surveys; astrostatistics; interferometric imaging techniques; data mining (e.g. machine learning); data visualization methods	
<b>Skills</b>	Model fitting; likelihoods; $\chi^2$ ; Bayesian analysis; Monte Carlo Markov Chains; error/uncertainty analysis; covariance/correlation matrices; cross and auto correlations; bootstrap tests; jackknife tests; stacking; Fourier transforms; power spectra; source peak finding; source fitting; catalogue construction; confusion analysis; source counts; luminosity functions; SED fitting; radio interferometry data reduction (full polarization) & imaging; Rotation Measure (RM) synthesis	
<b>Employment</b>	<a href="#">Dunlap Institute for Astronomy and Astrophysics, University of Toronto</a> Postdoctoral Research Associate, 2015 - Present Supervisor: <a href="#">Professor Bryan Gaensler</a>	
<b>Education</b>	<a href="#">University of British Columbia</a> , Vancouver, Canada PhD, Astronomy, Sept 2011 - Aug 2015 <ul style="list-style-type: none"><li>• Thesis: <i>The Faint Extragalactic Radio Sky</i></li><li>• Adviser: <a href="#">Professor Douglas Scott</a></li><li>• Co-Adviser: <a href="#">Professor Jasper Wall</a></li></ul> <a href="#">University of British Columbia</a> , Vancouver, Canada MSc, Astronomy, Sept 2009 - Sept 2011 <ul style="list-style-type: none"><li>• Thesis: <i>Contribution to the Diffuse Radio Background from Extragalactic Radio Sources</i></li><li>• Adviser: <a href="#">Professor Douglas Scott</a></li><li>• Co-Adviser: <a href="#">Professor Jasper Wall</a></li></ul> <a href="#">University of Minnesota</a> , Minneapolis, MN, United States BSc, Astrophysics, December 2008	
<b>Refereed Journal Publications</b>	<div>Total: 9</div> <div>First Author: 6</div> <div>h-index: 7</div> <div>g-index: 13</div>	

[Link to ADS search results - http://tinyurl.com/ybo95szx](http://tinyurl.com/ybo95szx)

1. Limiting Magnetic Fields in the Cosmic Web with Diffuse Radio Emission  
Brown, S., **Vernstrom, T.**, Carretti, E., Dolag, K., Gaensler, B. M., Staveley-Smith, L., Bernardi, G., Haverkorn, M., Kesteven, M., Poppi, S.  
*Monthly Notices of the Royal Astronomical Society*, 468 (2017)  
doi:[10.1093/mnras/stx746](https://doi.org/10.1093/mnras/stx746)
2. Low Frequency Radio Constraints on the Synchrotron Cosmic Web  
**Vernstrom, T.**, Gaensler, B. M., Brown, S., Lenc, E., Norris, R. P.  
*Monthly Notices of the Royal Astronomical Society*, 467 (2017)  
doi:[10.1093/mnras/stx424](https://doi.org/10.1093/mnras/stx424)  
Citations: **1**
3. A deep ALMA image of the Hubble Ultra Deep Fields  
Dunlop, J.S. +35 co-authors, **Vernstrom, T.**  
*Monthly Notices of the Royal Astronomical Society*, 466 (2017)  
doi:[10.1093/mnras/stw3088](https://doi.org/10.1093/mnras/stw3088)  
Citations: **60**
4. Deep 3 GHz Observations of the Lockman Hole North with the Very Large Array - 2. Catalogue and  $\mu$ Jy source properties  
**Vernstrom, T.**, Douglas Scott, J.V. Wall, J.J. Condon, W.D. Cotton, K.I. Kellermann, R.A. Perley  
*Monthly Notices of the Royal Astronomical Society*, 462 (2016)  
doi:[10.1093/mnras/stw1836](https://doi.org/10.1093/mnras/stw1836)  
Citations: **5**
5. Deep 3 GHz Observations of the Lockman Hole North with the Very Large Array - 1. Source extraction and uncertainty analysis  
**Vernstrom, T.**, Douglas Scott, J.V. Wall, J.J. Condon, W.D. Cotton, R.A. Perley  
*Monthly Notices of the Royal Astronomical Society*, 461 (2016)  
doi:[10.1093/mnras/stw1530](https://doi.org/10.1093/mnras/stw1530)  
Citations: **1**
6. The Deep Diffuse Extragalactic Radio Sky at 1.75 GHz  
**Vernstrom, T.**, Norris, Ray P., Scott, Douglas, Wall, J.V.  
*Monthly Notices of the Royal Astronomical Society*, 447 (2015)  
doi:[10.1093/mnras/stu2595](https://doi.org/10.1093/mnras/stu2595)  
Citations: **16**
7. Deep 3 GHz Number Counts from a  $P(D)$  Fluctuation Analysis  
**Vernstrom, T.**, Douglas Scott, J.V. Wall, J.J. Condon, W.D. Cotton, E.B. Fomalont, K.I. Kellermann, N. Miller, R.A. Perley  
*Monthly Notices of the Royal Astronomical Society*, 404 (2014)  
doi:[10.1093/mnras/stu470](https://doi.org/10.1093/mnras/stu470)  
Citations: **29**
8. Resolving the Radio Source Background: Deeper Understanding through Confusion  
Condon, J.J., Cotton, W.D., Fomalont, E. B., Kellerman, K., Miller, N., Perley, R.A., Scott, D., **Vernstrom, T.**, Wall, J.V.

*Astrophysical Journal*, 758, 23C (2012)

doi:[10.1088/0004-637X/758/1/23](https://doi.org/10.1088/0004-637X/758/1/23)

Citations: **91**

9. Contribution to the Diffuse Radio Background from Extragalactic Radio Sources

**Vernstrom, T.**, Scott, Douglas., & Wall, J.V.

*Monthly Notices of the Royal Astronomical Society*, 415 (2011)

doi:[10.1111/j.1365-2966.2011.18990.x](https://doi.org/10.1111/j.1365-2966.2011.18990.x)

Citations: **31**

**Published  
Conference  
Proceedings**

Total: 2

First Author: 1

1. Astronomy Below the Survey Threshold in the SKA Era

Zwart, J. + 16 co-authors, **Vernstrom, T.**

*Proceedings of Science, Proceedings of Advancing Astrophysics with the Square Kilometre Array*, 172 (2015)

PoS: [AASKA14172](https://ui.adsabs.org/abs/2015PoS(AASKA14)172)

Citations: **4**

2. Deep Source-Counting at 3 GHz

**Vernstrom, T.**, Wall, J.V., Scott, Douglas

*Proceedings of the International Astronomical Union*, 306, 177-181 (2014)

doi:[10.1017/S1743921314011053](https://doi.org/10.1017/S1743921314011053)

**Published  
Data/Catalogs**

Total: 1

1. Lockman Hole North 3GHz Source Catalogue

[Vizier online data](https://vizier.cfa.harvard.edu/vizier/objinfo/2000+0000+0000/1)

**Talks and  
Posters**

Invited Talks: 6

Contributed Talks: 9

Posters: 3

1. **Invited Talk:** The Radio Synchrotron Background Workshop; Richmond, VA. Jul 2017

Title: *Diffuse Extragalactic Synchrotron Emission and the Radio Background*

2. **Invited Talk:** Colloquium; Osservatorio Astronomico Cagliari; Sardinia, Italy. Jun 2017

Title: *The Faint Extragalactic Radio Background*

3. **Invited Talk:** Colloquium; INAF Radio Astronomy Institute; Bologna, Italy. Jun 2017

Title: *The Faint Extragalactic Radio Background*

4. **Contributed Talk:** Science at Low Frequencies III; Pasadena, CA. Dec 2016

Title: *Low Frequency Constraints on the Synchrotron Cosmic Web*

5. **Contributed Talk:** SKA meeting; Goa, India. Nov 2016  
Title: *Detecting the Synchrotron Cosmic Web with the SKA and Pathfinders*
6. **Contributed Talk:** SPARCS 2016; Goa, India. Nov 2016  
Title: *Clarifying Confusion*
7. **Contributed Talk:** ASKAP meeting; Sydney, Australia. Jun 2016  
Title: *Detecting the Synchrotron Cosmic Web*
8. **Poster:** MeerKAT meeting; Stellenbosch, South Africa. May 2016  
Title: *Detecting the Synchrotron Cosmic Web*
9. **Contributed Talk:** MWA Annual Project Meeting; Toronto, ON. Dec 2015  
Title: *The What, How, and Why of Confusion*
10. **Invited Talk:** SPARCS 2015, Kruger Park South Africa, July 2015  
Title: *MicroJansky Radio Sources: Counts, Confusion, and Catalogues*
11. **Contributed Talk:** 225<sup>th</sup> AAS Meeting; Seattle, WA. Jan 2015  
Title: *The Faint Extragalactic Radio Sky on Small and Large Angular Scales*
12. **Contributed Talk:** Joint UBC/SFU/TRIUMF Cosmology Meeting; Vancouver, CA. Oct 2014  
Title: *The Faint Extragalactic Radio Sky on Small and Large Angular Scales*
13. **Invited Talk:** Colloquium; University of Minnesota, MN, Oct 2014  
Title: *The Faint Extragalactic Radio Sky on Small and Large Angular Scales*
14. **Invited Talk:** KICP High Energy Messengers: Connecting the Non-Thermal Extragalactic Backgrounds; Chicago, IL. Jun 2014  
Title: *The Radio Background: Recent estimates from discrete and extended sources*
15. **Contributed Talk:** Canadian Astronomical Society Meeting (CASCA); Vancouver, CA. May 2013  
Title: *The Deepest View of the Radio Universe at 3 GHz*
16. **Contributed Talk:** The Modern Radio Universe; Bonn, Germany. April 2013  
Title: *The Deepest View of the Radio Universe at 3 GHz*
17. **Poster Presentation:** Cosmology for the Next Generation Winter School; Cancun, Mexico. Jan. 2012.  
Title: *Population of microJy radio sources*
18. **Poster Presentation:** 217<sup>th</sup> AAS Meeting; Seattle, WA. Jan 2011.  
Title: *Contribution to the Diffuse Radio Background from Extragalactic Radio Sources*

**Collaborations** MWA, POSSUM, EMU, MeerKAT/MIGHTEE

**Press  
Releases**

Total: 2

**Dunlap Institute Press Release** : *The Search for the Radio Cosmic Web and Large-Scale Cosmic Magnetism Begins*, April 2017

**NRAO Press Release** : *VLA Gives Deep, Detailed Image of Distant Universe*, April 2013

**Telescope  
Proposals**

Total: 14

PI: 4

Primary-investigator on [1] and Co-Author on [1] Giant Metrewave Radio Telescope (GMRT) proposal

Primary-investigator on [2] and Co-Author on [1] Atacama Large Millimeter Array (ALMA) proposals

Co-author on [5] Jansky Very Large Array (VLA) proposals

Primary-investigator on [1] and Co-Author on [3] Australian Telescope Compact Array (ATCA) proposals

**Observing  
Experience**

GMRT – remote obs. – May 2014

VLA – remote obs. – Feb 2014, Feb 2012

ATCA – onsite obs. – May 2012

**Teaching &  
Student  
Supervision**

Years of Teaching Experience: 8

Number of Courses as TA: 10

Number of students supervised (or co-supervised): 2

Co-supervisor student undergraduate senior research project, 2016 – Present

Co-supervisor summer student research project, summer 2017

Guest Lecture, ASTR 309 - Galaxies (2013, 2014)

Guest Lecture, ASTR 311 - Stars and Galaxies For Arts Students (2013)

School	Course Title	Course Type		
		Tutorial	Lab	Marking
UBC	Galactic Astronomy	X		X
	Statistics for Astronomers			X
	History and Philosophy of Physics	X		X
	Stars and Galaxies For Arts Students**	X		X
	Frontiers of Astronomy			X
	Introduction to Stars and Galaxies	X	X	X
	Introduction to the Solar System	X	X	X
	Introductory Physics		X	X
Minnesota	Introduction to Astronomy	X	X	
	Calculus I			X

\*\*Special TA position as part of the Carl Wieman Science Education Initiative,  
<http://www.cwsei.ubc.ca>

**Leadership &  
Participation**

Member of Dunlap Institute Summer School admissions committee (2017)

Postdoc/Scientist representative on the Dunlap Management Committee (2015-Present)

Member Dunlap/Gaensler Postdoc hiring committee (2015)

Peer Reviewer for Journals:

- Monthly Notices of the Royal Astronomical Society

Volunteer Judge for undergraduate posters Chambliss Award 225<sup>th</sup> AAS Meeting (2015)

Participant in UBC (Physics and Astronomy) 3 Minute Thesis Competition (2014)

Mentor in Physics and Astronomy UBC mentorship Program (2012-2014)

Member of Canadian Astronomical Society (CASCA) 2013 Meeting Local Organizing Committee (2012-2013)

- Additionally: Lead Volunteer /Volunteer Coordinator

Co-Organizer of the CASCA Graduate Student Workshop (2013)

Judge for Astronomy Talks, Canadian Undergraduate Physics Conference (CUPC) (2012)

Organizer BC Astronomy Winter Retreat (2012)

## **Public Outreach**

Dunlap Instrumentation Summer School Lab/Tutorial leader (August 2016)

UBC Summer Science Camp: Helped plan astronomy activities and taught groups of elementary school children (summer 2011, 2012, 2013)

Public Lecture: UBC Astronomy Club (March 2012)

Public Observing Nights: UBC (Fall 2009)

Public Observing Nights: University of Minnesota (2007-2009)

Elementary School Classroom volunteering: MN, USA (2006-2008)

## **Computer Software**

Astronomy Analysis Software:

- CASA, Miriad, AIPS, OBIT, WSclean, DS9, Aegean, Bane, WCStools, TOPCAT, Pymoresane, CosmoMC, CIAO/Sherpa

Computer Languages:

- Python, Fortran, IDL, shell scripting, C++, Perl

## **Workshops, Summer Schools**

EVLA Data Reduction Workshop; NM, USA. Feb 2012

ERIS European Radio Interferometry Summer School; Italy. Sept 2011

Novel Telescopes for 21 cm Cosmology; Canada,. June 2011

ALMA Proposal Workshop; Victoria, Canada. March 2011

**References**

**Prof. Bryan Gaensler** e-mail: [bgaensler@dunlap.utoronto.ca](mailto:bgaensler@dunlap.utoronto.ca)

- Director of the [Dunlap Institute](#)
- ◇ University of Toronto; Toronto, ON, Canada

**Prof. Ray Norris** e-mail: [raypnorris@gmail.com](mailto:raypnorris@gmail.com)

- Professor at [CSIRO Astronomy & Space Science](#)
- ◇ Western Sydney University; Sydney, NSW, Australia

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- ◇ University of British Columbia; Vancouver, BC, Canada

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