

# Dr. Kazimierz Sliwa

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## RESEARCH INTERESTS

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Molecular Gas; Interstellar Medium; Luminous Infrared Galaxies; Galaxy Mergers; Giant Molecular Clouds; Galactic-Scale Star Formation; Isotopic Abundances; Radiative Transfer; Submillimeter Astronomy

## PROFESSIONAL DEVELOPMENT

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### Postdoctoral Researcher

*Max Planck Institute for Astronomy*

Working on radiative transfer modelling of molecular gas in galaxy mergers and giant molecular cloud analyses in nearby galaxies.

**Heidelberg**

*2015–present*

### PhD Candidate

*McMaster University*

Worked on interferometric data of several luminous infrared galaxies to constrain the physical conditions of the molecular gas as a function of merger stage.

**Hamilton**

*2011–2015*

### MSc Student

*McMaster University*

Worked on interferometric data of the local galaxy merger Arp 299 studying the physical conditions of the molecular gas. Work is published in Sliwa et al. (2012) in *The Astrophysical Journal*.

**Hamilton**

*2009–2011*

### Research Assistant

*University of Toronto*

Worked on spectral data of a high mass X-ray binary system obtained using the Triple Spec spectrometer from the Palomar observatory, as well as previous spectral data taken with the Spitzer space telescope. Supervised by Dr. Dae-sik Moon.

**Toronto**

*2008–2009*

## OBSERVING EXPERIENCE

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*IRAM 30m*

Six days at the observatory

*July 2017*

*SMA*

Five days at the observatory

*June 2017*

*CARMA*

Spent one week as the resident observer where I had the responsibility of running the observatory during the night and day.

*July 2013*

*IRAM 30m*

Spent 5 days observing my accepted project.

*December 2012*

*JCMT*

Spent 1 week as the resident observer.

*November 2012*

## COMPUTING SKILLS

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**Data Reduction:** CASA (advanced), miriad (basic), STARLINK (basic), GILDAS (basic)

**Scripting:** Python (advanced), IDL (advanced), UNIX (intermediate), IRAF (basic), SQL (basic)

**Other:** Git (intermediate), HTML (intermediate), CSS (intermediate), LaTeX (advanced)

## EDUCATION

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<b>McMaster University</b> <i>PhD, Advisor: Dr. Christine Wilson</i> Thesis: Molecular Gas Properties in Local Luminous Infrared Galaxies	<b>Hamilton, Canada</b> 2011–2015
<b>McMaster University</b> <i>MSc, Advisor: Dr. Christine Wilson</i> Thesis: SMA Observations of the Local Galaxy Merger Arp 299	<b>Hamilton, Canada</b> 2009–2011
<b>University of Toronto</b> <i>BSc, Advisor: Dr. Dae-Sik Moon</i> Majored in astrophysics, physics and chemistry	<b>Toronto, Canada</b> 2003–2009

## AWARDS

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<b>The A. Boyd McLay Ontario Graduate Scholarship</b> 2014–2015	<b>\$15,000</b>
<b>Student Proposals for Intellectual Community &amp; Engaged Scholarship</b> 2014–2015	<b>\$4,200</b>
<b>Dr. Ronald V. Joyce Ontario Graduate Scholarships in Science</b> 2013–2014	<b>\$15,000</b>
<b>Student Proposals for Intellectual Community &amp; Engaged Scholarship</b> 2013–2014	<b>\$4,000</b>
<b>Queen Elizabeth II Graduate Scholarships in Science &amp; Technology</b> 2012–2013	<b>\$15,000</b>
<b>NSERC Undergraduate Student Research</b> 2008	<b>\$8,200</b>

## Conferences, Workshops and Presentations

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<b>Behind the Curtain of Dust II - The Molecular View of Activity in (U)LIRGs</b> <i>Talk: "Revisiting <math>^{13}\text{CO}</math> in Luminous Infrared Galaxies" (Invitation only)</i>	<b>Sesto, Italy</b> 2017
<b>CfA SMA Seminar</b> <i>Talk: ????</i>	<b>Boston, USA</b> 2017
<b>CASCA Annual Meeting 2017</b> <i>Poster: "The Case of the Missing <math>^{13}\text{CO}</math> in Luminous Infrared Galaxies"</i>	<b>Edmonton, Canada</b> 2017
<b>PHANGS Team Meeting 2016</b> <i>Participant</i>	<b>Heidelberg, Germany</b> 2016
<b>Havard-Heidelberg Star Formation Workshop</b> <i>Poster: "A Tale of Woe for <math>^{13}\text{CO}</math> in Luminous Infrared Galaxies"</i>	<b>Heidelberg, Germany</b> 2016
<b>PHANGS Data Reduction Team Meeting</b> <i>Participant</i>	<b>Toulouse, France</b> 2016
<b>Half a Decade of ALMA</b> <i>Talk: "A Tale of Woe for <math>^{13}\text{CO}</math> in Luminous Infrared Galaxies"</i>	<b>Indian Wells, USA</b> 2016

<b>Half a Decade of ALMA</b>	<b>Indian Wells, USA</b>
<i>Poster: "Cloud Scale View of Spiral Galaxies: First Results from the Nearby Galaxy M74"</i>	2016
<b>XGal Molecular Gas Workshop</b>	<b>Charlottesville, USA</b>
<i>Poster+1min: "Resolved Molecular Gas Properties of Local Luminous Infrared Galaxies"</i>	2016
<b>Ohio State University Seminar</b>	<b>Columbus, USA</b>
<i>Talk: "Molecular Gas in Local Luminous Infrared Galaxies"</i>	2016
<b>IAU General Meeting Symposium 315</b>	<b>Honolulu, USA</b>
<i>Poster: "Resolved Molecular Gas Properties of Local Luminous Infrared Galaxies"</i>	2015
<b>CASCA Annual Meeting</b>	<b>Hamilton, Canada</b>
<i>Talk: "Resolved Molecular Gas Properties of Local Luminous Infrared Galaxies"</i>	2015
<b>CASCA Annual Meeting</b>	<b>Hamilton, Canada</b>
<i>Talk: "McMaster's Sidewalk Astronomy: Taking Astronomy to the Streets"</i>	2015
<b>CASCA Annual Meeting</b>	<b>Hamilton, Canada</b>
<i>Poster: "Resolved Molecular Gas Properties of Local Luminous Infrared Galaxies"</i>	2015
<b>AAS 225th Meeting</b>	<b>Seattle, USA</b>
<i>Talk: "Resolved Molecular Gas Properties of Local Luminous Infrared Galaxies"</i>	2015
<b>Hokkaido University Seminar</b>	<b>Sapporo, Japan</b>
<i>Talk: "Resolved Molecular Gas Properties of Local Luminous Infrared Galaxies"</i>	2014
<b>Extragalactic Astrochemistry Workshop</b>	<b>Tokyo, Japan</b>
<i>Participant</i>	2014
<b>Revolution in Astronomy with ALMA</b>	<b>Tokyo, Japan</b>
<i>Poster: "NGC1614: The Ring of Cold, Dense Molecular Gas"</i>	2014
<b>CASCA Annual Meeting</b>	<b>Quebec, Canada</b>
<i>Talk: "Luminous Infrared Galaxies as seen with Modern Interferometers"</i>	2014
<b>Mozilla Software Carpentry Bootcamp</b>	<b>Hamilton, Canada</b>
<i>Participant</i>	2014
<b>Gas and Stars in Galaxies: A Multi-wavelength 3D Perspective</b>	<b>Garching, Germany</b>
<i>Poster: "Luminous Infrared Galaxies with the SMA"</i>	2014
<b>NRAO TUNA Talk</b>	<b>Charlottesville, USA</b>
<i>Talk: "A Look at Luminous Infrared Galaxies with the SMA"</i>	2014
<b>CASCA Annual Meeting</b>	<b>Vancouver, Canada</b>
<i>Poster: "Luminous Infrared Galaxies with the Submillimeter Array"</i>	2013
<b>Star Formation Jamboree</b>	<b>Hamilton, Canada</b>
<i>1 min slide: "Exploring the Starburst of Arp 299"</i>	2013
<b>Joint Astronomy Center Seminar</b>	<b>Hilo, USA</b>
<i>Talk: "Luminous Infrared Galaxies with the SMA"</i>	2012
<b>Galactic Scale Star Formation Conference</b>	<b>Heidelberg, Germany</b>
<i>Poster + 1 min: "Exploring the Starburst of Arp 299"</i>	2012
<b>CASCA Annual Meeting</b>	<b>London, Canada</b>
<i>Poster: "High Resolution Interferometric Observations of the Local Galaxy Merger Arp 299"</i>	2011

**McMaster Symposium Day**

Talk: "SMA Observations of the Local LIRG Arp 299"

**Hamilton, Canada**

2010

**Twelfth Synthesis Imaging Summer School**

Participant

**Socorro, NM, USA**

2010

**Successful Observing Proposals****ALMA**

<i>Cycle 4: Project 0921</i>	<i>PI; High Priority</i>
"Stirring the Pot: Giant Molecular Clouds in the Local Galaxy Merger NGC 3256"	
<i>Cycle 4: Project 0777</i>	<i>PI; High Priority</i>
"Nucleosynthesis Enrichment in a Cosmic Yo-Yo"	
<i>Cycle 3: Project 0804</i>	<i>PI; Filler</i>
"The Galaxy Merger Process: Molecular Gas Properties at the Beginning and the End"	
<i>Cycle 3: Project 0714</i>	<i>PI; High Priority</i>
"Stirring the Pot: Giant Molecular Clouds in the Local Galaxy Merger NGC 3256"	
<i>Cycle 3: Project 0287</i>	<i>PI; Filler</i>
"The Almost Forgotten Local Ultra Luminous Infrared Galaxy: IRAS 13120-5453"	
<i>Cycle 2: Project 0379</i>	<i>PI; Filler</i>
"The Forgotten Local Ultra Luminous Infrared Galaxy: IRAS 13120-5453"	
<i>Cycle 2: Project 0469</i>	<i>PI; High Priority</i>
"The Warm Molecular Gas of VV 114"	

**CARMA**

<i>Project c1062</i>	<i>PI; Granted 27.5hrs</i>
"Observations of $^{13}\text{CO}$ J=2-1 in Luminous Infrared Galaxies"	
<i>Project c1060</i>	<i>PI; Granted 19hrs</i>
"Constraining the Physical Conditions of Arp 299"	
<i>Project c0988</i>	<i>PI; Granted 34hrs</i>
"Mapping the Molecular Gas of Luminous Infrared Galaxies"	
<i>Project c0873</i>	<i>PI; Granted 22hrs</i>
"CO Observations of Luminous Infrared Galaxies"	

**IRAM 30m**

<b><i>Project 055-17 (Large Program)</i></b>	<i>PI; Granted 173 hrs</i>
"Carbon and Oxygen Isotopic Ratios in M51"	
<i>Project 180-12</i>	<i>PI; Granted 36hrs</i>
"Mapping the Molecular Gas in Luminous Infrared Galaxies"	

**NOEMA**

<i>Project W16BL</i>	<i>PI; Granted 20.2hrs</i>
"In a Luminous Infrared Galaxy Far, Far Away: Observations of $^{13}\text{CO}$ and $\text{C}^{18}\text{O}$ in UGC 5101"	

**JCMT**

<i>Project M12BC14</i>	<i>PI; Granted 39hrs</i>
"Mapping CO J=2-1 in Luminous Infrared Galaxies"	
<i>Project M11AC06</i>	<i>PI; Granted 22hrs</i>
"Observations of Arp 299 in CO J=2-1"	

**SMA**

<i>2016B: Project S035</i>	<i>PI; Granted 10 tracks</i>
"A Cloud-Scale Map of CO J=2-1-to-J=1-0 Line Ratio in M51"	
<i>2012B: Project S029</i>	<i>PI; Granted 8 hrs</i>
"Exploring the Dense Molecular Gas of Arp 299"	

## Community Service

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### ApJ Referee

#### Star Formation and ISM in Nearby Galaxies Meeting

Heidelberg, Germany

Organizer

2016–present

Organize bi-weekly meetings to discuss star formation and ISM matters in nearby galaxies.

#### PHANGS Team Meeting

Heidelberg, Germany

Organizer

Dec 2016

Organized and ran the PHANGS collaboration team meeting held at MPIA.

#### Canadian Undergraduate Physics Conference

Hamilton, Canada

Judge

Fall 2013

Volunteered to judge talks given by undergraduates from all over Canada.

#### Departmental Graduate Student Mentor

Hamilton, Canada

Mentor

2012–2014

Volunteered to mentor an incoming graduate student to the department.

## Education and Outreach

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#### McMaster's Sidewalk Astronomy

Hamilton, Canada

Co-Founder/Organizer

2012–2015

Setup weekly public observing events on McMaster's campus. Secured funding to purchase another telescope and other equipment. Over 3000 participants have attended as of April 2015.

#### McMaster McCallion Planetarium

Hamilton, Canada

Presenter

2010–2015

Presented interactive planetarium shows (of my own design) to public and private groups such as school classes, cub scouts and day camps. As of November 2014, 107 shows have been given.

#### Let's Talk Science

Hamilton, Canada

Volunteer

2010–2015

Let's Talk Science is a national organization devoted to improving science literacy by providing science-learning programs to kids. Volunteered to help with the "All Science Challenge Fun House" demonstrating simple science experiments to elementary school kids as they came into the room. *Was named the Volunteer of the Month for September 2014.*

#### Science Rendezvous

Hamilton, Canada

Volunteer

2013–2015

Science Rendezvous is a national day of science. Helped with scientific activities all over the city of Hamilton, Ontario.

#### McMaster Venus Transit Public Viewing

Hamilton, Canada

Volunteer

June 2012

Volunteered to help out with the public viewing of the transit of Venus across the Sun, a twice in a lifetime event, with the departmental 30 cm telescope.

#### McMaster Science and Engineering Olympics

Hamilton, Canada

Volunteer

2012–2014

An event held on the McMaster campus that hosts various science and engineering activities that high school kids take part in and compete against other schools. Volunteered to help out with the "Physics Paper Triathlon" where I was in charge of the bridge building competition.

#### McMaster University

Hamilton, Canada

Teaching Assistant

2009–2015

Ran tutorials and labs, supervised tests and exams, and marked homework assignments, lab reports, tests, and exams for several courses.

## PUBLICATIONS

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### Referred:.....

- 11. **Sliwa, K.**, Wilson, C.D., Aalto, S. and Privon, G.C. , *Extreme CO Isotopic Abundance in the ULIRG IRAS 13120-5453: An Extremely Young Starburst or Top-heavy Initial Mass Function*, 2017, *ApJL*, 840, L11
- 10. **Sliwa, K.** and Downes, D., *PdBI U/LIRG Survey (PULS): Dense Molecular Gas in Arp 220 and NGC 6240*, 2017, *A&A*, in press, arXiv:1704.03766
- 9. **Sliwa, K.** , Wilson, C.D., Petitpas, G.R., Matsushita, S., Peck, A.B., Saito, T., Yun, M., *Luminous Infrared Galaxies with the Submillimeter Array V: Molecular Gas in Intermediate to Late-Stage Mergers*, 2017, *ApJ*, in 840, 8
- 8. Jiménez-Donaire, M. J., Cormier, D., Bigiel, F., Leroy, A. K., Gallagher, M., Krumholz, M. R., Usero, A., Hughes, A., Kramer, C., Meier, D., Murphy, E., Pety, J., Schinnerer, E., Schrubba, A., Schuster, K., **Sliwa, K.**, Tomicic, N.,  *$^{13}\text{CO}/\text{C}^{18}\text{O}$  Gradients Across the Disks of Nearby Spiral Galaxies*, 2017, *ApJL*, 836, 29
- 7. Privon, G. C., Aalto, S., Falstad, N., Muller, S., González-Alfonso, E., **Sliwa, K.**, Treister, E., Costagliola, F., Armus, L., Evans, A. S., Garcia-Burillo, S., Izumi, T., Sakamoto, K., van der Werf, P., Chu, J. K., *The Dense Molecular Gas and Nuclear Activity in the ULIRG IRAS 13120-5453*, 2017, *ApJ*, 835, 213
- 6. Saito, T., Iono, D., Xu, C. K., **Sliwa, K.**, Ueda, J., Espada, D., Kaneko, H., König, S., Nakanishi, K., Lee, M., Yun, M. S., Aalto, S., Hibbard, J. E., Yamashita, T., Motohara, K., Kawabe, R., *Spatially Resolved CO SLED of the Luminous Merger Remnant NGC 1614 with ALMA*, 2017, *ApJ*, 835, 174
- 5. Leroy, A. K., Hughes, A., Schrubba, A., Rosolowsky, E., Blanc, G. A., Bolatto, A. D., Colombo, D., Escala, A., Kramer, C., Kruijssen, J. M. D., Meidt, S., Pety, J., Querejeta, M., Sandstrom, K., Schinnerer, E., **Sliwa, K.**, Usero, A., *A Portrait of Cold Gas in Galaxies at 60 pc Resolution and a Simple Method to Test Hypotheses that Link Small-Scale ISM Structure to Galaxy-Scale Processes*, 2016, *ApJ*, 831, 16
- 4. Querejeta, M., Schinnerer, E., García-Burillo, S., Bigiel, F., Blanc, G. A., Colombo, D., Hughes, A., Kreckel, K., Leroy, A. K., Meidt, S. E., Meier, D. S., Pety, J. and **Sliwa, K.**, *AGN Feedback in the Nucleus of M51*, 2016, *A&A*, 593, 118
- 3. **Sliwa, K.**, Wilson, C. D., Iono, D., Peck, A. and Matsushita, S., *Around the Ring We Go: The Cold, Dense Ring of Molecular Gas in NGC 1614*, 2014, *ApJL*, 796, L15
- 2. **Sliwa, K.**, Wilson, C.D., Krips, M., Pepitpas, G.R., Iono, D., Juvela, M., Matsushita, S., Peck, A.B., and Yun, M., *Luminous Infrared Galaxies with the Submillimeter Array IV.  $^{12}\text{CO} J=6-5$  Observations of VV 114*, 2013, *ApJ*, 777, 126
- 1. **Sliwa, K.**, Wilson, C.D., Pepitpas, G.R., Armus, L., Juvela, M., Matsushita, S., Peck, A.B., and Yun, M.S, *Luminous Infrared Galaxies with the Submillimeter Array III. The Kiloparsec Molecular Concentrations of Arp 299*, 2012, *ApJ*, 753, 46

Non-Refereed.....

- 1. **Sliwa, K.**, Wilson, C. D., Iono, D., Peck, A. and Matsushita, S., *Around the Ring We Go: The Cold, Dense Ring of Molecular Gas in NGC 1614*, 2015, ASPC, 499, 141