

# Kenny X. Van

ASTRONOMY PHD CANDIDATE

CCIS 2-108, Department of Physics, University of Alberta, Edmonton, AB Canada

☎ (+780)-885-5022 | ✉ kvan@ualberta.ca | 🏠 kvan1231.github.io/ | 📷 kvan1231 | 🌐 kvan1231 | 📞 0000-0003-3862-5826

## Research Interests

stellar astrophysics, stellar multiplicity, high energy astrophysics, stellar populations, hydrodynamics, numerical methods

## Education

### University of Alberta

PHD CANDIDATE IN PHYSICS

- Thesis: "Binary Evolution and Magnetic Braking"
- Advisor: Professor Natalia Ivanova

Edmonton, Canada

Sept. 2017 - Present

### University of Alberta

MASTER OF SCIENCE IN PHYSICS

- Thesis: "Select Topics in Mass Transfer and Magnetic Braking"
- Advisor: Professor Natalia Ivanova

Edmonton, Canada

Sept. 2015 - Aug 2017

### University of Alberta

UNDERGRADUATE DEGREE IN PHYSICS

- Major: Astrophysics

Edmonton, Canada

Sept. 2010 - Apr. 2015

## Research

### The Effect of Magnetic Braking on Low Mass X-ray Binaries

GRADUATE RESEARCH

- Project focusing on different magnetic braking prescriptions on low mass X-ray binaries
- I show that the commonly used prescription is ineffective in reproducing many observed systems.
- Derive an improved magnetic braking prescription that self consistently reproduces a sample of observed binaries.
- Use statistical analysis to determine the properties of progenitors that produce low mass X-ray binaries.

Edmonton, Canada

Sept. 2017 - Present

### Select Topics in Mass Transfer and Magnetic Braking

GRADUATE RESEARCH

- Investigate an novel binary formation channel with a semi-degenerate donor
- Examine the stability criteria in binary systems with a massive donor

Edmonton, Canada

Sept. 2015 - Aug. 2017

### Black Hole Binaries in Globular Clusters

UNDERGRADUATE RESEARCH

- Supervised by professor Natalia Ivanova at the University of Alberta
- Simple project using **MESA** to simulate a collection of black hole binaries.

Edmonton, Canada

Fall 2014

### Finding a Pattern in the Outbursts of SS Cygni

UNDERGRADUATE RESEARCH

- Supervised by professor Gregory Sivakoff at the University of Alberta
- Studied the outbursts of a well observed cataclysmic variable SS Cygni using python code.

Edmonton, Canada

Winter 2013

## Teaching Experience

### Senior Undergraduate / Graduate Astronomy Course

TEACHING ASSISTANT

- Provided ongoing support for students in the course in running stellar simulations.
- Aided students in performing analysis of numerical outputs from stellar simulations.
- Provide teaching support for this course every Fall semester from 2016 onwards.

University of Alberta

Sept. 2019 - Dec. 2020

### Senior Undergraduate / Graduate Computational Physics Course

TEACHING ASSISTANT

- Provided computing and coding support to students using python and jupyter notebooks.
- Graded the assignments of the students.

University of Alberta

Sept. 2019 - Dec. 2019

## Undergraduate Astronomy Course

TEACHING ASSISTANT

- Graded assignments and midterms for an undergraduate astronomy course in a timely manner.
- Graded work for this course every Winter semester from 2016 onwards.

University of Alberta

Jan. 2018 - Mar. 2019

## Undergraduate Physics Lab

TEACHING ASSISTANT / LAB SUPERVISOR

- Supervised and graded an undergraduate physics lab covering classical physics experiments.

University of Alberta

Sept. 2015 - Apr. 2016

## Awards

---

- 2021 **\$12000**, Alberta Graduate Excellence Scholarship
- 2020 **\$12000**, Alberta Graduate Excellence Scholarship
- 2018 **\$7500**, Queen Elizabeth II Scholarship
- 2016 **\$1500**, FGSR Graduate Travel Grant

## Proposals

---

### Resources for Research Groups Competition

COMPUTE CANADA

2019

- Awarded 314 CPU core years and 6 GPU core years as a member of the Ivanova research group.

## Publications

---

### Evolving LMXBs: CARB Magnetic Braking

VAN, K. X., IVANOVA, N.

Nov. 2019

- Published in Astrophysical Journal Letters.
- We derive and introduce a new magnetic braking scheme which can effectively reproduce a sample of well studied observed LMXBs.

### Low Mass X-ray Binaries: The Effects of Magnetic Braking Prescription

VAN, K. X., IVANOVA, N., HEINKE, C. O.

Dec. 2018

- Published in Monthly Notices of the Royal Astronomical Society.
- A study of the most commonly used magnetic braking prescription and how effectively this prescription can reproduce observed LMXBs.
- We definitively show that the most commonly used prescription fails to reproduce observed systems and should not be used.

### Formation of Black Hole X-Ray Binaries With Non-Degenerate Donors in Globular Clusters

IVANOVA, N., DA ROCHA, C. A., VAN, K. X., NANDEZ, J. L. A.

Jul. 2017

- Published in Astrophysical Journal Letters.
- Presented an alternative method in producing black hole X-ray binaries where a black hole captures a subgiant donor and strips a significant amount of mass off the donor.

### Stability of mass transfer from massive giants: double black-hole binary formation and ultra-luminous X-ray sources

PAVLOVSKII, K., IVANOVA, N., BELCZYNSKI, K., VAN, K. X.

Feb. 2017

- Published in Monthly Notices of the Royal Astronomical Society.
- Showed that there is a range where mass transfer from massive giants onto a black hole is stable.
- This significantly reduced the simulated BH-BH binary formation rate to fall in line with LIGO observations

## Presentations & Talks

---

### Constraining Progenitors of Observed LMXBs Using CARB Magnetic Braking

ONLINE POSTER PRESENTATION AT CASCA YORK

Online

May. 2020

- I show the derivation and effectiveness of our new magnetic braking scheme, the CARB MB.

### Inverse Population Synthesis: Searching for the Origins

POSTER PRESENTATION AT CASCA MONTREAL

Montreal, Canada

Jun. 2019

- Present a new magnetic braking scheme that effectively reproduces a subset of well studied low-mass X-ray binaries.

### pgstar

PRESENTATION AT MESA SUMMER SCHOOL

Santa Barbara, USA

Aug. 2018

- Gave a tutorial on the plotting tools built into MESA.

## Low Mass X-ray Binaries: Population at Roche Lobe Overflow

Victoria, Canada

POSTER PRESENTATION AT CASCA VICTORIA

May. 2018

- Showed that the commonly used magnetic braking prescription cannot reproduce many observed systems. Modifications to the default magnetic braking scheme must be made in order to reproduce many observed systems.

## Low Mass X-ray Binaries: Population at Roche Lobe Overflow

Edmonton, Canada

POSTER PRESENTATION AT CASCA EDMONTON

May. 2017

- Showed that the commonly used magnetic braking prescription cannot reproduce many observed systems.

## Poster Presentation at the UCSB

Santa Barbara, USA

STABILITY OF MASS TRANSFER FROM MASSIVE GIANTS

Mar. 2017 - May. 2017

- Showed a novel binary formation method involving a black hole accretor and a semi-degenerate donor.

## Poster Presentation at Binary Stars in Cambridge

Cambridge, England

STABILITY OF MASS TRANSFER FROM MASSIVE GIANTS

Jul. 2016

- Showed a novel binary formation method involving a black hole accretor and a semi-degenerate donor.

# Conferences & Workshops

---

## CASCA York

Online

CONFERENCE ATTENDEE

May. 2020

- Gave a online poster presentation showing the effectiveness of our new magnetic braking prescription and how it can help use determine progenitors of observed binaries.
- Website: <http://casca2020.yorku.ca/>

## CASCA Montreal

Montreal, Canada

CONFERENCE ATTENDEE

Jun. 2019

- Gave a poster presentation showing a new magnetic braking prescription which can reproduce a subset of observed persistent low mass X-ray binaries.
- Website: <http://www.physics.mcgill.ca/casca2019/>

## Westgrid Summer School

Calgary, Canada

WORKSHOP ATTENDEE

May. 2019

- Participated in a computational summer school covering machine learning, data mining, and scientific computing.
- Website: <https://westgrid.github.io/calgarySummerSchool2019/>

## MESA Summer School

Santa Barbara, USA

SUMMER SCHOOL TEACHING ASSISTANT

Aug. 2018

- Introduced **MESA** and gave a tutorial on the in-built plotting tools.
- Provided teaching support for the other courses offered at the summer school
- Website: [http://cococubed.asu.edu/mesa\\_summer\\_school\\_2018/](http://cococubed.asu.edu/mesa_summer_school_2018/)

## CASCA Victoria

Victoria, Canada

CONFERENCE ATTENDEE

May. 2018

- Gave a poster presentation showing that the commonly used magnetic braking schemes are ineffective at reproducing observed binary systems.
- Showed that modifications to the default magnetic braking scheme must be made in order to reproduce many observed systems.

## CASCA Edmonton

Edmonton, Canada

CONFERENCE ATTENDEE

May. 2017

- Gave a poster presentation showing preliminary results suggesting that the default magnetic braking used in simulation is ineffective in reproducing observed binaries.

## The Mysteries and Inner Workings of Massive Stars

Santa Barbara, USA

CONFERENCE ATTENDEE

Mar. 2017 - May. 2017

- Gave a poster presentation showing a novel binary formation method involving a black hole accretor and a semi-degenerate donor.
- Website: <https://www.kitp.ucsb.edu/activities/stars17>

## Binary Stars in Cambridge

Cambridge, England

CONFERENCE ATTENDEE

Jul. 2016

- Gave a poster presentation showing a novel binary formation method involving a black hole accretor and a semi-degenerate donor.
- Website: <https://www.ast.cam.ac.uk/meetings/2016/binary.stars.cambridge.2016>

# Professional Service

---

## **Vice Chair**

CASCA GRADUATE STUDENT COUNCIL

2020 - Present

- Help organize the graduate student council representing astronomy graduate students in Canada.
- Regularly schedule the informal "Coffee Hour" social events for CASCA.
- Primary council note taker during meetings.

## **Social Media Contributor**

CASCA GRADUATE STUDENT COUNCIL

2020 - Present

- Find articles related to Canadian astronomy and post to the CASCA GSC social media accounts on a weekly schedule.
- Accounts include cascagsc on Facebook and @casca\_gsc on Twitter and Instagram.

## **Graduate Representative**

CASCA REPRESENTATIVE

2018 - Present

- Graduate representative at of the Canadian Astronomical Society (CASCA)
- Represented the astronomy students at the University of Alberta as a member of the graduate student council.

## **UAlberta Astronomy Group**

MEETING ORGANIZER

2017 - 2020

- Organized and maintained the astronomy journal club and seminars of the University of Alberta astronomy group.

## **University of Alberta Observatory**

OBSERVATORY VOLUNTEER

Jan. 2017 - Mar. 2017

- Supervised public observing and school visits to the observatory.
- Gave talks on solar winds and meteorites accessible to the public or elementary aged students.