

# Kenny X. Van

ASTRONOMY PHD CANDIDATE

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

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## 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

## Awards

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

## 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

# Proposals

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## Resources for Research Groups Competition

COMPUTE CANADA

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

2019

# Publications

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## Evolving LMXBs: CARB Magnetic Braking

VAN, K. X., IVANOVA, N.

- 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.

Nov. 2019

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

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

- 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.

Dec. 2018

## 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.

- 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.

Jul. 2017

## 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.

- 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

Feb. 2017

# Presentations & Talks

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## Constraining Progenitors of Observed LMXBs Using CARB Magnetic Braking

ONLINE POSTER PRESENTATION AT CASCA YORK

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

Online

May. 2020

## Inverse Population Synthesis: Searching for the Origins

POSTER PRESENTATION AT CASCA MONTREAL

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

Montreal, Canada

Jun. 2019

## pgstar

PRESENTATION AT MESA SUMMER SCHOOL

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

Santa Barbara, USA

Aug. 2018

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

POSTER PRESENTATION AT CASCA VICTORIA

- 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.

Victoria, Canada

May. 2018

## 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, Canada

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

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## 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, Canada

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

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## 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.