Kenny X. **Van**

Astronomy PhD Candidate

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Research Interests

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

Education

University of Alberta *Edmonton, Canada*

PhD Candidate in Physics *Sept. 2017 - Present*

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

University of Alberta *Edmonton, Canada*

Master of Science in Physics *Sept. 2015 - Aug 2017*

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

University of Alberta *Edmonton, Canada*

Undergraduate Degree in Physics *Sept. 2010 - Apr. 2015*

- Major: Astrophysics

Research

The Effect of Magnetic Braking on Low Mass X-ray Binaries *Edmonton, Canada*

Graduate Research *Sept. 2017 - Present*

- A 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.

Select Topics in Mass Transfer and Magnetic Braking *Edmonton, Canada*

Graduate Research *Sept. 2015 - Aug. 2017*

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

Black Hole Binaries in Globular Clusters *Edmonton, Canada*

Undergraduate Research *Fall 2014*

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

Finding a Pattern in the Outbursts of SS Cygni *Edmonton, Canada*

Undergraduate Research *Winter 2013*

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

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 *University of Alberta*

Teaching Assistant *Sept. 2019 - Dec. 2020*

- 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.

Senior Undergraduate / Graduate Computational Physics Course

University of Alberta

Teaching Assistant

Sept. 2019 - Dec. 2019

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

Undergraduate Astronomy Course

University of Alberta

Teaching Assistant

Jan. 2018 - Mar. 2019

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

Undergraduate Physics Lab

University of Alberta

Teaching Assistant / Lab Supervisor

Sept. 2015 - Apr. 2016

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

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

Online Poster Presentation at CASCA York

May. 2020

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

Inverse Population Synthesis: Searching for the Origins

Montreal, Canada

Poster Presentation at CASCA Montreal

Jun. 2019

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

pgstar

Santa Barbara, USA

Presentation at MESA Summer School

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 may 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 may 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 Presenation 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/`

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

Vice Chair

CASCA Graduate Student Council *2020 - Present*

- Help organize the graduate student council representing astronomy graduate students in Canada.

Social Media Contributor

CASCA Graduate Student Council *2020 - Present*

- Find articles related to Canadian astronomy and post to the CASCA GSC social media websites.

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.