Craig O. Heinke

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Research Interests

Understanding neutron stars, black holes, white dwarfs, and how they accrete matter in binary systems; the interior physics of neutron stars; and how stars interact in dense clusters, through observations at multiple wavelengths (X-ray, optical, ultraviolet, infrared, and radio).

Positions

Professor — July 2018–
Dept. of Physics, U. of Alberta — Edmonton, AB, Canada

Associate Professor — July 2012–June 2018
Dept. of Physics, U. of Alberta — Edmonton, AB, Canada

Assistant Professor — July 2008–June 2012
Dept. of Physics, U. of Alberta — Edmonton, AB, Canada

Research Associate — Aug. 2007–June 2008
Supervisor C. L. Sarazin, U. of Virginia — Charlottesville, VA, USA

Lindheimer Postdoctoral Fellow — Sept. 2004–Aug. 2007
Dept. of Physics & Astronomy, Northwestern U. — Evanston, IL, USA

Education

Ph.D. Astronomy, Harvard University, Cambridge, MA, June 2004, advisor J. E. Grindlay

M.A. Astronomy, Harvard University, Cambridge, MA, June 2002

B.A. Physics, Carleton College, Northfield, MN, June 1997, *Magna Cum Laude*

Honors

Faculty of Science Associate Dean for Learning & Innovation "Bestie" Award, 2026

Interdepartmental Science Students' Society Excellence in Teaching Award, 2026

NSERC Discovery Accelerator Supplement Award, 2016

Faculty of Science Research Award, University of Alberta, 2015

Alexander von Humboldt Fellow, Bonn, Germany, 2015

Martha Cook Piper Research Prize, University of Alberta, 2012

Avenue Edmonton "Top 40 Under 40", 2012

Ingenuity New Faculty, Alberta Innovates, 2010-2013

Lindheimer Postdoctoral Fellowship, Northwestern University, 2004-2007

Certificate of Distinction in Teaching (Graduate School of Arts and Sciences, Harvard Univ.), 2004

Fireman Award for Best Doctoral Dissertation (Astronomy Dept., Harvard Univ.), 2004

Supervision (Numbers refer to papers in publication list.)

Postdocs:

Liliana Rivera Sandoval, 2020–21 (Avadh Bhatia Fellow, Gruber Foundation Fellow), (#195,184,179). **Asst. Prof.** at University of Texas, Rio Grande Valley, USA.

Aarran Shaw, 2016–2019. (#132,136,138,141,154,160,165,166, 170, 174, 179, 187). **Asst. Prof.** at Butler University, Indianapolis, USA.

Chengkui Li, (Int'l Fellow, Chinese Academy of Sciences (CAS); OrcID:0000-0001-5798-4491) 2015–2016. Research Associate at Inst. for High Energy Physics, CAS, Beijing, China. (#137)

Nathan Leigh (NSERC Fellow), 2013–2014. **Assoc. Prof.** at Universidad de Concepcion, Chile. (#93,96,166)

Jeanette Gladstone, (A. Bhatia Fellow; High-Energy Astrophysics Division's Dissertation Prize) 2009–2014. Public Outreach Coordinator at University of Alberta. (#73,75,76,77,84,89)

Graduate students:

Aysan Hemmatiortakand PhD 2026–now.

Gourav Kumawat PhD 2024–now (#234, 237, 247).

Margaret Ridder MSc 2019–2021, PhD 2021–2025 Radio observations of cataclysmic variables. (#208, 233, 252). Postdoc, Naval Research Laboratory, USA.

Zhao Jiaqi (Jake) MSc 2019–2021, PhD 2021–2025. X-ray studies of radio millisecond pulsars. (#182, 200, 213, 215, 216,220,227,237,238,244). Postdoc, Tsinghua Univ., China.

Pavan Hebbar MSc 2017–2019, PhD 2019–2026. Use of X-ray spectra to identify unusual objects, and applying machine learning. (#154,163,177, 210, 244) Data Scientist, Alberta Tax & Revenue Administration.

Zhao Yue (Cory) MSc/PhD 2016–2021. Optical/UV/X-ray/radio studies of globular cluster binaries. (#143,150,160,167,169,171,176,182,184,185,188,194,197). Postdoc, U. Southampton, UK.

Asma Hattawi MSc 2016–2019. Study of a magnetic CV in a globular cluster. Sharjah Planetarium assistant director, Sharjah, United Arab Emirates.

Reuben Gazer MSc 2015–2017. Using GALEX ultraviolet data to constrain the nature of X-ray sources. Data scientist (AltaML); physics teacher, St. Albert SD 5565. (#119,130)

Arash Bahramian PhD 2012–2016. X-ray binaries and globular clusters. Now **Senior Lecturer (tenured)** at Curtin University, Perth, Australia. (#63,73,84,86,89,92,98,103,104,108,112,114,126,137)

Khaled Elshamouty MSc 2010–2012, PhD 2012–2016. Neutron star cooling, and simulating the effects of hot spots on neutron stars. Now Data Science Team Lead for Sonova Group (health care). (#60,81,99,115,123)

Mizan Chowdhury, MSc 2009–2011, thesis on searching for quiescent X-ray binaries in the Small Magellanic Cloud. Service Canada Benefit Officer.

Undergraduate researchers:

George Coomber Sum 2009 (NSERC USRA), W 2009. Senior Gameplay Programmer, Haven Studios. (#59).

Clifton Price Su 2009, F 2009. Manager, The Fibre Nook.

Sonia Budac Su 2009, W 2010. Technical Designer, Full Circle Studio. (#46, 68).

Will Stacey Su 2010 (NSERC USRA), Su 2011, F 2011. Game Designer, Ludeon Studios. (#57, 63).

Rhys Chouinard W 2010. Director of Data Science, ATB Financial. (#123).

Taylor Cartwright F 2010, summer 2011. Pilot, Canadian Armed Forces. (#75,76,77).

Johannes (Hans) Berger W 2011. (#75).

Megan Engel Su 2011 (NSERC USRA), W 2012, Sum 2012. Rhodes Scholar, Oxford; now **Asst. Prof**, U. Calgary. (#60, 75, 76).

Andrei Catuneanu, W 2012, Su 2012 (NSERC USRA). Lead research scientist, Dana Canada Corp. (#71, 224).

Siobhan Crothers, W 2012. Solutions architect, Hitachi ID Systems. (#166).

James Sikora, W 2012. Researcher, Lowell Observatory.

Lindsay Fredrick (née Forestell), Su 2012, Su 2013 (NSERC USRA). Lead data scientist, BC Public Service. (#90, 132).

Tyler Naffin, F 2012.

Robin Arnason F 2012. Senior Scientist, Interface Fluidics. (#102).

Sam Rowe, W 2013, Su 2013.

Eric Koch Su 2013 (NSERC USRA). Assistant Scientist, National Radio Astronomy Observatory (NRAO), USA. (#92,166).

N. Thomas Denman W 2013, Sum 2013. Electronics engineer, NRAO, USA.

R. Lee Pavelich F 2013. PhD candidate in Engineering, U. Alberta.

C.J. Parr W 2014. (#166).

Curtis Brown W 2016.

Souradeep Bhattacharya Su 2016 (MITACS). **DST Inspire Faculty Fellow** at IUCAA, Pune, India. (#133).

Pavan Hebbar Su 2016 (UARE). (#177) PhD student, U. Alberta.

Asma Hattawi Su 2016. Planetarium assistant director, UAE.

Mario Ivanov Su 2017, Sum 2018. Junior optical engineer. (#166).

Tetiana Kozynets Su 2017. PhD student, Aarhus U., Denmark.

Chinmaya Verma Su 2017 (UARE). Software development engineer, Meesho.

Sean McClure Su 2017 (NSERC USRA). Research technician, D-Wave Systems. (#179).

Tianyin Luo F 2017, 2018, W 2019. Quality engineer, Lenovo.

Quinlan Ede W 2018. Lead data scientist, ATB Financial.

Su Fu F 2018, W 2019. Administration manager, Guangzhou, China. (#227).

Riley Andrews F 2018 (#166).

Samarveer Singh Rai F 2018. Director, Gurununak Foreign Tour and Travels, Ltd.

Oliver Boodram Su 2019, W 2021. PhD student U Colorado, Boulder. (#202).

Yumna Arshad Su 2019.

Vishwangi Shah Su 2019 (MITACS). PhD student, McGill U.

Tyler Burgardt W, Su 2022. General Manager, Jasper Planetarium.

Leoneil Xean Dela Pena W 2022.

Junwen Zheng Su 2022 (MITACS). PhD student, Northeastern Univ. (#234).

Angel Oswaldo Montes Palma W 2023 (UARE).

Matthew Lang W 2023.

Gourav Kumawat Su 2023 (MITACS). (#223).

Zoe Parker Su 2023 (UARE).

Viviana Cardona Ortiz Su 2024 (MITACS).

Simrat Toor F 2024 (#234).

Ben Stadel W 2025.

Jasmine Mehdwan F 2025 (#244).

Daniel Mendoza Fredes F 2025.

Suyash Kabra W 2026.

Tyler Heise W 2026 (#247)..

Divjot Sachdeva W 2026.

Summary: 68 papers published (or in press) involving graduate & undergraduate students, 26 grad student first-author, 12 undergrad student first-author. Five NSERC USRA summer students (**Coomber**, **Engel**, **Catuneanu**, **Forestell** & **Koch**) have subsequently won NSERC MSc-level scholarships; **Forestell** won a Killam Doctoral Scholarship at UBC; **Boodram** won a Sir James Lougheed scholarship (twice), and the Dean's Silver Medal in Science; **Engel** has also won a Rhodes Scholarship, a Sir James Lougheed scholarship, the NSERC Andre Hamer Postgraduate Prize, the Julie Payette NSERC Research Scholarship, a Schmidt Science Fellowship, an Alberta Science & Technology Leadership (ASTech) Award, and the CASCA Best Student Poster award (while an undergrad). **Bahramian** has won the Andrew Stewart Memorial Graduate Prize, a CASCA Best Student Poster Award, and a Graduate Student Teaching Award; **Gazer** won 2nd Prize Talk at the U. of A. Grad Physics Research Symposium; **Hebbar** won Best Oral Presentation and Best Poster, Grad Physics Research Symposium; the Valerie Jagoldas Award of U. Alberta, and an AGES award from the Physics Dept; **Zhao, Y.** won an AGES award from the Physics Dept; **Zhao, J.** won a China Scholarship Council PhD scholarship; **Ridder** won a Finlayson/Hollinshead International Graduate Scholarship and a CASCA Best Student Poster Award. **Kumawat** won an AGES award, the Myer Horowitz GSA Graduate Scholarship, and a Dept of Physics PhD Research Award.

External Awards of Research Funding as Principal Investigator

2024 Alberta Innovates Advance Program, $40,000.

2024 CSA AstroSAT grant, $19,402.

2008, 2011, 2016, 2023: NSERC Discovery Grants, $27,486/year (2008-2010), $28,000/year (2011-2015), $74,000/year (2016-2022), $38,000/year (2023-2028).

2016: NSERC Discovery Accelerator Supplement, $120,000 over 3 years.

2014: Alexander von Humboldt Fellow, €22,916 for a 6-month fellowship.

2010: Alberta Ingenuity New Faculty Award, $279,000 over 3 years.

Awards of Observing Time on Astronomical Telescopes

PI on approved telescope proposals (this list is now out of date): >10 *Chandra* X-ray, 3 Hubble, 7 XMM-Newton X-ray, 10 Gemini optical/IR, 2 VLA radio, 2 VLBA radio, >40 Swift X-ray, 1 NuSTAR X-ray, 1 AstroSAT. PhD student **Bahramian** PI of multiple approved XMM-Newton, Swift, & Gemini proposals. Postdoc **Shaw** PI of NuSTAR (250 hrs!), CFHT, Gemini, XMM-Newton, and Swift; PhD student **Y. Zhao** PI of 2 XMM proposals; Postdoc **Rivera Sandoval** PI of 4 HST, 1 TESS proposal; PhD student **Ridder** PI of 3 VLA proposals.

Lead organizer of Swift Key Project, "Swift Bulge Survey" in 2017, 2019, 2021, 2022; 55, 60, 60, 60 hrs of Swift X-ray/UV observations of Galactic Bulge to detect transients (I was not formal PI to allow NASA to fund co-PI in Texas). Project also awarded 10 hrs VLA time each round, and time on Gemini, SOAR, CFHT, and VLT telescopes.

Co-I on many successful telescope proposals, acquiring >1000 hrs of *Chandra* time under >12 different PIs, on 8 proposals acquiring >130 hrs of Hubble imaging, and on many successful proposals for JWST, RXTE, Swift, Suzaku, XMM-Newton, and NuSTAR (X-ray), Gemini, TNG, VLT, CFHT (optical and near-infrared), Herschel (far infrared), ATCA and VLA (radio).

Scientific Service–Peer Review

Member of Time Allocation Committees (TACs) for National Radio Astronomy Observatory (2 yr SRP member, then 3 yr SRP chair; Chair of full TAC 2021-2023), *Chandra* X-ray Observatory (6 years; Panel Chair in 2022, 2026), Rossi X-ray Timing Explorer (3 yr), XMM-Newton (2 yr), External Reviewer for Hubble (2025, 2026).

JWST External Panelist (2025), Panel Member (2026).

Member of NSERC Discovery Grants Physics Evaluation Group (2018-2021)

Chair of CFHT Large Program TAC 2018; member of CFHT Canada TAC 2018.

SuperChair (2012-2013) of CanTAC (which allocates time on overseas Canadian telescopes); Galactic Panel Chair 2012, member of CanTAC 2011-2013.

External referee for Gemini, CFHT, AstroSAT, HST, GMRT, JWST proposals.

External referee for funding proposal requests to NSERC, NSF, NASA, the Royal Society (UK), NWO (Netherlands), Ireland.

External referee for 5 PhD theses, at McGill University, U. Calgary, U. of Sydney, U. of Manitoba.

Referee for Nature, Science, Nature Astronomy, Astrophysical Journal (inc. Supplement & Letters), Astronomical Journal, Astronomy & Astrophysics, and Monthly Notices of the Royal Astronomical Society, averaging 10 papers/year.

Scientific Service–Organizations and Meetings

Chair of CASCA Ground-Based Astronomy Committee (2016-2017, 2024–).

Member of Chandra Users' Committee (2026–).

Member of Gemini Strategic Vision Planning Group (2025–2026).

Member of CASCA Awards Committee (2023–2025).

Chair (2021–2024) of Gemini Science and Technology Advisory Committee (member 2018–2024).

Reviewer, NRAO Conceptual Design Review for Telescope Time Allocation Tools program, 2020.

Red-team reviewer, Program Execution Plan for $26M "Gemini in the Era of Multi-Messenger Astronomy" proposal.

Chair of Local Organizing Committee, and lead organizer, for *CASCA 2017* (Edmonton, Canada). (Annual meeting of Canadian Astronomical Society, drawing 200 scientists from across Canada.)

Member of CASCA's Long-Range Plan Implementation Committee (LRPIC, 2016-2017).

Member of NSERC Scholarships & Fellowships Committee (2014-2017).

Chair of Gemini Observatory Users' Committee, 2014-2015; member 2012-2015.

Member of Scientific Organizing Committee for Chandra's Dynamic Universe workshop, Cambridge, 2026; *CASCA 2017*, Edmonton, 2017; *Physics of Neutron Stars 2014*, *Physics of Neutron Stars 2017*, *Physics of Neutron Stars 2020*(cancelled), St. Petersburg, Russia; COSPAR session E1, Istanbul, Turkey, 2016 (cancelled); *The Physics of Neutron Stars, and All That Jazz*, Montreal, Canada, 2015; *Compact Binaries in Globular Clusters*, Leiden, Netherlands, 2012.

Co-organizer of *MODEST-6, Modeling Dense Stellar Systems* conference (Northwestern U., 2005).

University Service

Academic Director (or Associate Chair) Graduate Studies, Physics Dept., 2018–2022, 2026–2029.

Associate Chair for Research, Physics Dept., 2015-2018.

Focus Area Coordinator for Astrophysics, Physics Strategic Planning Committee, 2012-2023.

Member, Equity, Diversity & Inclusion Committee of Physics Dept., 2025–2026.

Member of 6 Physics Dept. new faculty hiring committees; 2007-08, 2009-10, 2012, 2012-13, 2014, 2021. Member of Physics Dept. Chair Search committee 2020-2021.

Colloquium organizer for U. Alberta Physics Dept., 2009-2011.

Invited Colloquium/Seminar Talks since 2017

Indian Institute of Science Education & Research, Bhopal (remote), July 2023

Texas Tech Astrophysics Seminar, Lubbock, TX, Dec. 2022

U. Texas Rio Grande Valley Physics Colloquium, Brownsville, TX, Dec. 2022

U. Concepcion Astrophysics Seminar, Concepcion, Chile, Nov. 2022

Trinity College Physics Colloquium, San Antonio, TX, USA, Nov. 2022

Penn State Astro Colloquium, State College, PA, USA (remote), Sept. 2021

U. Alberta Physics Seminar, "Planning Remote Teaching of a Large Lecture", Edmonton, July 2020

Oregon State University Physics Colloquium, Corvallis, OR, USA, Nov. 2018

NYU Abu Dhabi Physics Seminar, Abu Dhabi, United Arab Emirates, April 2018

U. Manitoba Physics & Astronomy Colloquium, Winnipeg, MB, Canada, Jan. 2018

U. Alberta Physics Colloquium, Edmonton AB, Sept. 2017

McGill Space Institute Astronomy Seminar, Montreal QC, Canada, Feb. 2017

Michigan State University Astro seminar, Lansing MI, USA, Jan. 2017

Conference or International Online Seminar Talks since 2017

Ground-Based Astronomy Committee report to CASCA Mid-Term Review, online, February 2025 (invited)

The X-ray Mysteries of Neutron Stars and White Dwarfs, Madrid, Spain, June 2024 (invited)

MODEST-23: Star Clusters in the Post-Pandemic Era, Evanston IL, USA, Aug. 2023

McMaster Cluster Workshop 2022, Hamilton ON, Canada, Aug. 2022

JINA-INT Workshop on Neutron Star Cooling, Seattle WA, USA, Feb. 2022 (invited)

HEAD Frontier Seminar, online, July 2021

Neutron Stars as Multi-messenger laboratories for dense matter, Italy, May 2020 (invited; cancelled)

CRAQ, May 2020, Quebec (invited; declined)

XCALIBUR 2019: The Future of High-Resolution X-ray Spectroscopy, Winchester, UK, July 2019 (invited)

EWASS 2019, Lyon, France, June 2019 (invited)

Investigating Crusts of Neutron Stars, Amsterdam, Netherlands, April 2019 (invited)

COSPAR 2018, Pasadena, CA, US, July 2018 (invited)

MODEST-18: Dense Stellar Systems in the Era of Gaia, LIGO, & LISA, Santorini, Greece, June 2018

STROBE-X Science Definition Meeting, Lubbock, TX, US, Sept. 2017 (invited)

La Gomera Accretion Week, La Gomera, Canary Islands, Spain, Sept. 2017 (invited)

New Compstar annual meeting, Warsaw, Poland, March 2017 (invited)

Outreach Leadership

Arranged creation of scale model of solar system for west atrium of U. Alberta CCIS (science) building (http://www.ualberta.ca/∼stars/planets.html), 2009-2011.

Public Talks since 2020

Archbishop MacDonald Catholic High School, May 2026

Bev Facey High School, Edmonton, May 2026

Science FUNday, Edmonton, March 2026

RASC Edmonton, Edmonton, February 2026

Waldorf Independent School of Edmonton (9th grade), May 2025

Science FUNday March 2025

RASC Regina, March 2025

RASC Edmonton, Edmonton, June 2024

J. Percy Page High School, May 30, 2024

Waldorf Independent School of Edmonton (9th grade), April 2024

Oliver School (two 6th grade classes), Edmonton, April 2023

Science FUNday, Edmonton, March 2023

Bev Facey High School, May 2022

Science FUNWeek, Edmonton, March 2022

CESD 73 high school, Innisfail, Dec. 2021

Science FUNDay, Edmonton, March 2021

Science FUNDay, Edmonton, Feb. 2020

Media Interviews

Newspaper interview for Minneapolis (MN, USA) Star-Tribune on planetary alignment, Feb. 2025.

Short piece answering question on ambient light for CBC Quirks & Quarks, Sept. 2021.

Interview for CBC Radio One program "Silver and Exact" on mirrors, Dec. 2011.

Interviews for several print, electronic, and radio (CBC Quirks & Quarks, CBC Edmonton Radio Active) news sources relating to discovery of superfluidity in neutron star cores, Feb. 2011.

11 interviews for radio (CBC Quirks & Quarks), TV (City TV Edmonton, French CBC Edmonton), web-based (e.g. Space.com) and print (Edm. Journal, Edm. Sun-Times, Canadian Press, Physics World, Sky & Telescope) media relating to Nature paper, Nov. 2009.