

# KEVIN CROKER, ASTROPHYSICIST

GENERAL RELATIVITY / DARK ENERGY / PHENOMENOLOGY

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## APPOINTMENTS

### Affiliate Graduate Faculty

University of Hawai'i at Mānoa

August 2021 – Present    Honolulu, Hawai'i

- Small-team lead of research into phenomenological signatures of cosmologically coupled compact objects, across all astrophysical scales.
- Supervising Stephen Gulley, Hawai'i Space Grant Consortium

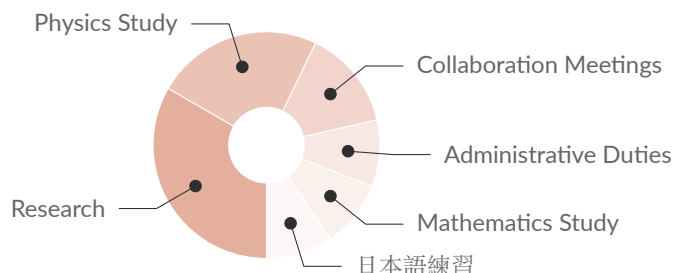
### Postdoctoral Research Fellow

University of Hawai'i at Mānoa

August 2018 – July 2021    Honolulu, Hawai'i

- Dynamics of relativistic sources (e.g. black holes) on cosmological timescales in GR. Applied mathematics and phenomenology.
- HEP/instrumentation, high-speed DAQ development for Large Area Picosecond Phototodector (LAPPD) technology.

## MY TYPICAL WORKDAY



## OUTREACH & ENGAGEMENT

### Weekly Space Hangout with Fraser Cane

Dr. Kevin Croker Explains “Cosmological Coupling”

December 29, 2021    Youtube (link)

### This Week in Science (TWiS)

#792: Where is the Dark Energy?

September 23, 2020    Youtube (link)

### “Somos científicos!” Conference Public Event

Ciudad de Camprodon

August 2016    Camprodon, Spain

### N-body Computer simulations: What, Why, and How?

Kamehameha / Kaiser / Mid Pac Schools

February 2015    Honolulu, Hawai'i

## EDUCATION

### Ph. D. in Physics

University of Hawai'i at Mānoa

August 2018

Thesis: “Friedmann Cosmology Without Assumptions on the Stress: Consistency and Application to the Dark Energy Problem”

### B. S. in Computer Science

Washington University in St. Louis

May 2005

## FELLOWSHIPS

### Fullbright Fellowship

University of Tartu

September 2015    Tartu, Estonia

### NSF EAPSI Fellowship

University of Tokyo / IPMU

June 2014    Kashiwanoha, Japan

## LEADERSHIP

### Reuniones de Cataluña Conference

Organizing Committee Chair

August 2016    Beget, Spain

### Department of Physics & Astronomy

Librarian

2010-2020    Honolulu, HI

## STRENGTHS

Collaboration    Creativity    Programming  
Interdisciplinary    Rigor    International

## LANGUAGES

English  
Spanish  
Japanese



# PUBLICATIONS

\*article titles link to NASA ADS

## First Author Papers

- **K. S. Croker**, J. L. Weiner, and D. Farrah, “Well-defined equations of motion without constraining external sources,” *Physical Review D*, vol. 105, no. 8, 084042, Apr. 2022.
- **K. S. Croker**, M. Zevin, D. Farrah, K. A. Nishimura, and G. Tarlé, “Cosmologically Coupled Compact Objects: A Single parameter Model for LIGO-Virgo Mass and Redshift Distributions,” *The Astrophysical Journal Letters*, vol. 921, no. 2, L22, p. L22, Nov. 2021.
- **K. S. Croker**, J. Runburg, and D. Farrah, “Implications of symmetry and pressure in Friedmann cosmology. III. Point sources of dark energy that tend toward uniformity,” *The Astrophysical Journal*, vol. 900, no. 1, p. 57, Nov. 2020.
- **K. S. Croker**, K. A. Nishimura, and D. Farrah, “Implications of symmetry and pressure in Friedmann cosmology. II. Stellar remnant black hole mass function,” *The Astrophysical Journal*, vol. 889, no. 2, p. 115, Feb. 2020.
- **K. S. Croker** and J. L. Weiner, “Implications of symmetry and pressure in Friedmann cosmology. I. Formalism,” *The Astrophysical Journal*, vol. 882, no. 1, p. 19, 2019.
- **K. A. S. Croker**, “Ngravs: Distinct gravitational interactions in GADGET-2,” *Computer Physics Communications*, vol. 207, pp. 478–486, 2016.

## Highlighted Contributed Papers

- D. Farrah, **K. S. Croker**, G. Tarlé, and et al., “Observational evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy,” *The Astrophysical Journal Letters*, vol. 944, no. 2, L31, DOI: 10.3847/2041-8213/acb704.
- D. Farrah, S. Petty, **K. S. Croker**, et al., “A Preferential Growth Channel for Supermassive Black Holes in Elliptical Galaxies at  $z \lesssim 2$ ,” *The Astrophysical Journal*, vol. 943, no. 2, 133, p. 133, Feb. 2023. DOI: 10.3847/1538-4357/acac2e. arXiv: 2212.06854 [astro-ph.GA].

## Contributed Papers

- D. Farrah, A. Efstathiou, J. Afonso, et al., “Stellar and black hole assembly in  $z < 0.3$  infrared-luminous mergers: Intermittent starbursts versus super-eddington accretion,” *Monthly Notices of the Royal Astronomical Society*, vol. 513, no. 4, pp. 4770–4786, 2022.
- D. Farrah, A. Efstathiou, J. Afonso, et al., “Molecular Gas Heating, Star Formation Rate Relations, and AGN Feedback in Infrared-Luminous Galaxy Mergers,” *Universe*, vol. 9, no. 1, p. 3, Dec. 2022.
- A. D. Martin and **K. A. Croker**, “Clustered computing for political science,” *The Political Methodologist*, vol. 12, no. 1, p. 3, 2004.

## Conference Proceedings

- **K. Croker**, G. Jocher, K. Nishimura, and V. Shebalin, *Design and first performance results of waveform sampling readout electronics for large area picosecond photodetector*, 11, vol. 15, IOP Publishing, 2020, p. C11016.

# TEACHING & WORK EXPERIENCE

University of Hawai‘i at Mānoa

**Introductory Electricity and Magnetism**

 2019

 Guest Lecturer

- Lectured on introductory electrostatics, circuits, Lenz’ law, etc.
- Conducted after-lecture help sessions

University of Hawai‘i at Mānoa

**Advanced Physics Laboratory**

 2012-2018

 Head TA/Lecturer

# SERVICE WORK

The Astrophysical Journal Letters

**Peer Reviewer**

 2023-Present

Classical and Quantum Gravity

**Peer Reviewer**

 2023-Present

Monthly Notices of the Royal  
Astronomical Society

**Peer Reviewer**

 2023-Present

- Developed and revised course materials / software for senior-level course covering the interaction of radiation with matter and other sensing technologies, e.g. NMR, SQUID
- Improved and repaired apparatus

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## University of Hawai'i at Mānoa

### General Physics III Laboratory

📅 2012-2018      📍 Head TA/Lecturer

- Modernized a writing-intensive course at the sophomore level covering waves and quantum mechanics
- Improved pedagogy, introduced  $\text{\LaTeX}$ , extended and repaired apparatus

## Physics of the Dark Universe

### Peer Reviewer

📅 2023-Present

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## Chambliss Astronomy Achievement Student Award

### Judge

📅 2023      📍 AAS Winter Meetings

## Honolulu District Science and Engineering Fair

### Judge

📅 2015-2019      📍 Honolulu, HI

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# INVITED & CONTRIBUTED TALKS

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## The Open University

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 December 13, 2023      📍 Milton Keynes, UK

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## Cardiff University

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 December 12, 2023      📍 Cardiff, Wales

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## University College London

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 December 11, 2023      📍 London, UK

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## University of Cambridge DAMTP

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 December 8, 2023      📍 Cambridge, UK

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## 19th Appleton Space Conference

### The First Observational Link Between Black Holes and Dark Energy

📅 December 7, 2023      📍 Harwell, UK

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## University of Oxford

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 December 6, 2023      📍 Oxford, UK

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## Washington University in St. Louis

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 June 23, 2023      📍 St. Louis, MO

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## Arizona State University Cosmology Seminar

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 June 14, 2023      📍 Tempe, AZ

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## MIT Laboratory for Nuclear Science

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 May 9, 2023      📍 Boston, MA

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## Weinberg Institute TCCAP Seminar

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 March 21, 2023      📍 Austin, TX

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## Johns Hopkins AstroCoffee

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 March 17, 2023      📍 Baltimore, MD

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## Flatiron CCA Lunch Seminar

### Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy

📅 March 16, 2023      📍 Manhattan, NY

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## Rutgers High Energy Theory Seminar

**Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy**

📅 March 14, 2023

📍 Newark, NJ

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## Yale Galaxies Journal Club

**A preferential growth channel for supermassive black holes in elliptical galaxies at  $z \lesssim 2$**

📅 March 8, 2023

📍 New Haven, CT

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## UMass Boston Physics Seminar

**Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy**

📅 March 7, 2023

📍 Boston, MA

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## Tufts Astronomy Seminar

**A preferential growth channel for supermassive black holes in elliptical galaxies at  $z \lesssim 2$**

📅 March 6, 2023

📍 Medford, MA

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## Bishop's University Physics Colloquium

**Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy**

📅 February 24, 2023

📍 Sherbrooke, Canada

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## UH Mānoa HEP Journal Club

**Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy**

📅 February 14, 2023

📍 (Virtual)

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## University of Michigan Physics Seminar

**Evidence for cosmological coupling of black holes and its implications for an astrophysical source of dark energy**

📅 December 16, 2022

📍 Ann Arbor, MI

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## University of Washington CENPA Seminar

**Physics across thirty orders of magnitude in time**

📅 October 31, 2022

📍 Seattle, WA

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## University of Michigan Physics Seminar

**Generic Objects of Dark Energy (GEODEs): Implications for black hole evolution and cosmology**

📅 November 16, 2020

📍 (Virtual)

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## UH Mānoa Physics Colloquium

**The GEODE mass function and its astrophysical implications**

📅 May 2, 2019

📍 Honolulu, HI

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## OIST Quantum Gravity Unit Seminar

**The GEODE mass function and its astrophysical implications**

📅 April 10, 2019

📍 Onna, Japan

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## University of Tokyo RESCEU Seminar

**The GEODE mass function and its astrophysical implications**

📅 April 8, 2019

📍 Tokyo, Japan

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## NAOJ Seminar

**The GEODE mass function and its astrophysical implications**

📅 April 8, 2019

📍 Mitaka, Japan

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## CfA ITC Seminar

**Cosmological tests of the gravastar hypothesis**

📅 April 6, 2018

📍 Cambridge, MA

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## Queen's University Physics Seminar

**Cosmological tests of the gravastar hypothesis**

📅 March 29, 2018

📍 Kingston, Canada

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## Bishop's University Physics Colloquium

**Cosmological tests of the gravastar hypothesis**

📅 March 27, 2018

📍 Sherbrooke, Canada

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## LANL Theory Division Seminar

**Cosmological tests of the gravastar hypothesis**

📅 March 22, 2018

📍 Los Alamos, NM

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## UCSC SCIPP Seminar

**Cosmological tests of the gravastar hypothesis**

📅 March 20, 2018

📍 Santa Cruz, CA

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## UCSB Physics Seminar

**Cosmological tests of the gravastar hypothesis**

📅 March 15, 2018

📍 Santa Barbara, CA

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## Stanford KIPAC Seminar

### Cosmological tests of the gravastar hypothesis

📅 March 13, 2018

📍 Stanford, CA

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## Hirosaki University Physics Colloquium

### Metric theories for non-gravitational specialists

📅 November 17, 2016

📍 Hirosaki, Japan

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## Contributed

### AAS 241

### Observational status of cosmological coupling in black holes

📅 January 12, 2023

📍 Seattle, WA

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## 2020 IEEE Nuclear Science Symposium

### Integrated Readout Electronics for Large Area Picosecond Photodectors

📅 November 3, 2020

📍 (Virtual)

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## PCGM34

### Cosmological tests of the gravastar hypothesis

📅 March 16, 2018

📍 Pasadena, CA

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## Reuniones de Cataluña

### Metric theories for non-gravitational specialists

📅 August 6, 2016

📍 Beget, Spain

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## Tartu-Tuorla Annual Meeting

### *ngravs*: Distinct gravitational interactions in Gadget-2

📅 September 25, 2015

📍 Võru, Estonia

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## PCGM31

### *ngravs*: Distinct gravitational interactions in Gadget-2

📅 March 13, 2015

📍 Eugene, OR

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