Jason Kristiano

Postdoctoral Researcher in Theoretical Physics.

Research Center for the Early Universe (RESCEU), Graduate School of Science,
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Research Interest

Quantum field theory of fluctuations generated during cosmic inflation.

Keywords: Cosmic inflation, cosmological perturbation, quantum field theory in curved spacetime, cosmological correlators, cosmological bootstrap, and primordial black holes.

Personal

- Year of Birth: 1997
- Place of Birth: Jakarta, Indonesia
- Nationality: Indonesian
- Language: Indonesian (Native), English (Advanced), and Japanese (Passed JLPT N3)

Education

Doctor of Philosophy (Ph.D.) in Physics 2021/10–2024/09

- Institution: Department of Physics, The University of Tokyo
- Supervisor: Prof. Jun'ichi Yokoyama
- Thesis: *Quantum Nature of Cosmological Perturbations from Small to Large Scales*
- Support: JSPS DC1 Fellowship and GSGC Scholarship (Partial)

Master of Science (M.Sc.) in Physics 2019/09–2021/09

- Institution: Department of Physics, The University of Tokyo
- Supervisor: Prof. Jun'ichi Yokoyama
- Thesis: *Theoretical bound on primordial non-Gaussianity in single-field inflation*
- Support: MEXT Scholarship and GSGC Scholarship (Inactive)

Bachelor of Science (S.Si.) in Physics 2015/08–2018/08

- Institution: Department of Physics, Universitas Indonesia
- Supervisor: Prof. Terry Mart
- Thesis: *Pure spin-3/2 representation for use in particle and nuclear physics*
- Support: Indonesia International Science Olympiad Scholarship

Career

JSPS DC1 and PD Research Fellow 2022/04–

- Institution: Department of Physics, The University of Tokyo
- Supervisor: Prof. Jun'ichi Yokoyama
- Grant: 2,500,000 JPY for 3 years
- Project: Cosmological correlators as a probe of fundamental physics

Research Assistant (Internship) 2019/04–2019/06

- Institution: IBM T. J. Watson Research Center, New York, United States
- Supervisor: Dr. Oki Gunawan
- Project: Theoretical aspect of magnetic trap system

Reviewer

- Journal of Cosmology and Astroparticle Physics (JCAP)
- General Relativity and Gravitation

Publication and Preprint

10. J. Kristiano and J. Yokoyama, *Comparing sharp and smooth transitions of the second slow-roll parameter in single-field inflation*, Journal of Cosmology and Astroparticle Physics **10** (2024) 036 [arXiv:2405.12145].

9. J. Kristiano and J. Yokoyama, *Generating large primordial fluctuations in single-field inflation for PBH formation*, Invited chapter to the book "Primordial Black Holes" by Springer (in press) [arXiv:2405.12149].

8. J. Kristiano and J. Yokoyama, *Constraining Primordial Black Hole Formation from Single-Field Inflation*, Physical Review Letters **132**, 221003 (2024) [arXiv:2211.03395].

7. J. Kristiano and J. Yokoyama, *Note on the bispectrum and one-loop corrections in single-field inflation with primordial black hole formation*, Physical Review D **109**, 103541 (2024) [arXiv:2303.00341].

6. J. Kristiano and J. Yokoyama, *Perturbative region on non-Gaussian parameter space in single-field inflation*, Journal of Cosmology and Astroparticle Physics **07** (2022) 007 [arXiv:2204.05202].

5. J. Kristiano and J. Yokoyama, *Why Must Primordial Non-Gaussianity Be Very Small?*, Physical Review Letters **128**, 061301 (2022) [arXiv:2104.01953].

4. O. Gunawan, J. Kristiano, and H. Kwee, *Magnetic-tip trap system*, Physical Review Research **2**, 013359 (2020) [arXiv:1906.05680].

3. J. Kristiano, R.D. Lambaga, and H.S. Ramadhan, *Coleman-de Luccia tunneling wave function*, Physics Letters B **796**, 225-229 (2019) [arXiv:1808.10110].

2. T. Mart, J. Kristiano, and S. Clymton, *Pure spin-3/2 representation with consistent interactions*, Physical Review C **100**, 035207 (2019) [arXiv:1909.04282].

1. J. Kristiano, S. Clymton, and T. Mart, *Pure spin-3/2 propagator for use in particle and nuclear physics*, Physical Review C (Rapid Communication) **96**, 052201 (2017) [arXiv:1710.07930].

Press Release

2. J. Kristiano and J. Yokoyama, *The case of the missing black holes: New model aims to explain the lack of miniature black holes in the early universe*, The University of Tokyo, May 2024 (English and Japanese), quoted by news media from various countries.

1. J. Kristiano and J. Yokoyama, *Quantum nature makes spacetime fluctuations in the early Universe to be very symmetrical*, The University of Tokyo, March 2022 (English and Japanese).

Invited Talk

Conference or Workshop

7. *Cosmological correlators in slow-roll violating inflation*, Looping in the Primordial Universe Workshop, The European Organization for Nuclear Research (CERN), Switzerland, October 2024.

6. *Single-field inflation and primordial black holes*, Quantum Aspects of Inflationary Cosmology Workshop, Munich Institute for Astro-, Particle and BioPhysics (MIAPbP), Germany, July 2024.

5. *Comparing sharp and smooth transitions of the second slow-roll parameter in single-field inflation*, Extreme Mass Dark Matter Workshop (YITP International Molecule-type Workshop), Kyoto University, Japan, March 2024.

4. *Progress on one-loop correction in PBH formation from single-field inflation*, Revisiting cosmological non-linearities in the era of precision surveys (YITP International Molecule-type Workshop), Kyoto University, Japan, July 2023.

3. *Bispectrum and one-loop correction in PBH formation from single-field inflation*, Non-linear Nature of Cosmological Perturbations and its Observational Consequences (YITP Domestic Molecule-type Workshop), Kyoto University, Japan, March 2023.

2. *Ruling out primordial black hole formation from single-field inflation*, Dynamics of Primordial Black Hole Formation Workshop, Rikkyo University, Japan, March 2023.

1. *Primordial black holes from single-field inflation?*, Cosmology and Particle Astrophysics (CosPA), Asia Pacific Center for Theoretical Physics (APCTP), South Korea, November 2022 (Online).

Seminar or Colloquium

12. *Cosmological correlators in slow-roll violating inflation*, Theoretical Physics Group Seminar, Scuola Normale Superiore, Italy, November 2024.

11. *Single-field inflation with large fluctuations*, Department of Physics (Cosmology Group) Seminar, Waseda University, Japan, July 2024.

10. *Bispectrum and one-loop correction in PBH formation from single-field inflation*, Department of Physics (Particle Theory and Cosmology Group) Seminar, Tohoku University, Japan, May 2023.

9. *Exploring possibilities of the inflationary potential*, Rikkyo University Colloquium, Japan, April 2023.

8. *Primordial black holes from single-field inflation?*, Leung Center for Cosmology and Particle Astrophysics (LeCosPa) Seminar, National Taiwan University, Taiwan, April 2023 (Online).

7. *Bispectrum and one-loop correction in PBH formation from single-field inflation*, Zooming in on Primordial Black Holes Seminar, Leiden University, The Netherlands, April 2023 (Online).

6. *Ruling out primordial black hole formation from single-field inflation*, Theory Group Seminar, High Energy Accelerator Research Organization (KEK), Japan, March 2023.

5. *Ruling out primordial black hole formation from single-field inflation*, Institute of Theoretical Physics Seminar, Chinese Academy of Sciences, China, February 2023 (Online).

4. *Ruling out primordial black hole formation from single-field inflation*, Department of Physics (C-Lab) Seminar, Nagoya University, Japan, January 2023.

3. *One-loop perturbativity bound as a constraint on single-field inflation and primordial black hole formation*, Department of Physics (High Energy Theory Group) Seminar, The University of Athens, Greece, December 2022 (Online).

2. *One-loop perturbativity bound in single-field inflation*, Department of Physics (Particle Theory Group) Seminar, The University of Tokyo, Japan, November 2022.

1. *What happened before the Big Bang?*, Department of Physics Seminar, Universitas Indonesia, Indonesia, March 2022 (Online).

Selected Contributed Talk

Oral Presentation

6. *Comparing sharp and smooth transitions of the second slow-roll parameter in single-field inflation*, The 27th International Conference on Particle Physics and Cosmology (COSMO), Kyoto University, Japan, October 2024.
5. *One-loop correction in primordial black hole formation from single-field inflation*, Focus Week on Primordial Black Holes, Kavli IPMU, Japan, November 2023.
4. *Superhorizon evolution of the squeezed bispectrum*, Correlators in Cortona, Italy, September 2023.
3. *One-loop correction in primordial black hole formation from single-field inflation*, The 26th International Conference on Particle Physics and Cosmology (COSMO), Instituto de Física Teórica, Spain, September 2023.
2. *One-loop perturbativity bound in single-field inflation*, The 31st Workshop on General Relativity and Gravitation in Japan (JGRG), The University of Tokyo, Japan, October 2022.
1. *Perturbative region on non-Gaussian parameter space in single-field inflation*, The 15th Asia-Pacific Physics Conference (APPC), South Korea, August 2022 (Online).

Poster Presentation

2. *One-loop perturbativity bound in single-field inflation*, 2nd International Symposium on Trans-Scale Quantum Science (TSQS), The University of Tokyo, Japan, November 2022.
1. *Theoretical bound on primordial non-Gaussianity in single-field inflation*, The 24th International Conference on Particle Physics and Cosmology (COSMO), University of Illinois, United States, August 2021 (Online).

Award

- Graduated *cum laude* with GPA 3.96/4 (the highest over all bachelor graduates) from Universitas Indonesia, August 2018.
- Bronze medal, 46th International Physics Olympiad (IPhO), Mumbai, India, July 2015.
- Honorable mention, 16th Asian Physics Olympiad (APhO), Hangzhou, China, May 2015.

Membership

- The Physical Society of Japan (JPS).
- Association of Japanese Theoretical Astronomy and Astrophysics (Rironkon).

Reference

Jun'ichi Yokoyama

- Affiliation: Director, Kavli Institute for the Physics and Mathematics of the Universe (Kavli IPMU), The University of Tokyo, Japan.
- Contact: `junichi.yokoyama@ipmu.jp`

David Wands

- Affiliation: Professor of Cosmology, Institute of Cosmology and Gravitation, University of Portsmouth, United Kingdom.
- Contact: `david.wands@port.ac.uk`