# Reginald Christian Bernardo, Ph.D.

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https://reggiebernardo.github.io

https://github.com/reggiebernardo

### **Research Interests**

Gravitational Waves, Cosmology, Dark Energy, Black Holes, Alternative Gravity

### **Highlights**

Codes (/1) **PTAfast**: PTA correlations from stochastic gravitational wave background, ascl:2211.001.

Papers (/31)

- R. C. Bernardo and K.-W. Ng, Stochastic gravitational wave background phenomenology in a pulsar timing array, Phys. Rev. D 107, 044007 (2023), arXiv:2208.12538 [gr-qc].
- R. C. Bernardo and K.-W. Ng, Pulsar and cosmic variances of pulsar timing-array correlation measurements of the stochastic gravitational wave background, JCAP 11 (2022) 046, arXiv:2209.14834 [gr-qc].
- R. C. Bernardo, D. Grandon, J. Levi Said, and V. H. Cardenas, Parametric and nonparametric methods hint dark energy evolution, Phys. Dark Univ. 36 (2022) 101017, arXiv:2111.08289 [astro-ph.CO].
- R. C. Bernardo, J. Levi Said, M. Caruana, and S. Appleby, Well-tempered Minkowski solutions in teleparallel Horndeski theory, 2022 Class. Quantum Grav. 39 015013, arXiv:2108.02500 [gr-qc].
- R. C. Bernardo, Gravitational wave signatures from dark sector interactions, Phys. Rev. D 104, 024070 (2021), arXiv:2103.02311 [gr-qc].

# **Employment History**

2021 – pres Postdoctoral Fellow, Institute of Physics, Academia Sinica, Taiwan

2021 – 2021 Assistant Professor, National Institute of Physics, University of the Philippines

2015 – 2020 Instructor, National Institute of Physics, University of the Philippines

#### **Education**

2017 – 2020 Ph.D. Physics, University of the Philippines Diliman

Thesis title: Compact objects, cosmologies, and gravitational perturbations in scalar-tensor theories of gravity

2015 – 2017 M.Sc. Physics, University of the Philippines Diliman

Thesis title: Some consequences of the generalized uncertainty principle: energy levels, thinlayer quantization, and quantum dynamics

2010 – 2015 **B.Sc. Physics, University of the Philippines Diliman** 

Thesis title: Bound states, quantum scattering, and dynamics in one-dimensional systems with minimal length

# **Research Papers**

#### **Articles**

Bernardo, R. C., & Ng, K.-W. (2023a). Constraining gravitational wave propagation using pulsar timing array correlations. arXiv: 2302.11796 [gr-qc]

- Bernardo, R. C., & Chen, C.-Y. (2023). Dressed black holes in the new tensor-vector-scalar theory. *Gen. Rel. Grav.*, 55(1), 23. 60 doi:10.1007/s10714-023-03075-x. arXiv: 2202.08460 [gr-qc]
- Bernardo, R. C., Grandón, D., Levi Said, J., & Cárdenas, V. H. (2023). Dark energy by natural evolution: Constraining dark energy using Approximate Bayesian Computation. *Phys. Dark Univ.*, 40, 101213.

  6 doi:10.1016/j.dark.2023.101213. arXiv: 2211.05482 [astro-ph.CO]
- Bernardo, R. C., & Ng, K.-W. (2023b). Stochastic gravitational wave background phenomenology in a pulsar timing array. *Phys. Rev. D*, 107(4), 044007. 6 doi:10.1103/PhysRevD.107.044007. arXiv: 2208.12538 [gr-qc]
- Bernardo, R. C., & Lee, Y.-R. (2022). Hubble constant by natural selection: Evolution chips in the Hubble tension. arXiv: 2212.02203 [astro-ph.CO]
- Villegas, K. H. A., & Bernardo, R. C. (2022). Quantum and higher curvature corrections to the anti-de Sitter black hole. arXiv: 2208.07663 [gr-qc]
- Bernardo, R. C., & Ng, K.-W. (2022a). Looking out for the Galileon in the nanohertz gravitational wave sky. arXiv: 2206.01056 [astro-ph.CO]
- 8 Appleby, S., & Bernardo, R. C. (2022). Tadpole cosmology: self tuning without degeneracy. *JCAP*, 07(07), 035. Odoi:10.1088/1475-7516/2022/07/035. arXiv: 2202.08672 [astro-ph.C0]
- 9 Bernardo, R. C., Chen, C.-Y., Said Levi, J., & Kung, Y.-H. (2022). Confronting quantum-corrected teleparallel cosmology with observations. *JCAP*, 04(04), 052. Odi:10.1088/1475-7516/2022/04/052. arXiv: 2111.11761 [gr-qc]
- Bernardo, R. C., Grandón, D., Said Levi, J., & Cárdenas, V. H. (2022). Parametric and nonparametric methods hint dark energy evolution. *Phys. Dark Univ.*, 36, 101017. 6 doi:10.1016/j.dark.2022.101017. arXiv: 2111.08289 [astro-ph.CO]
- Bernardo, R. C., & Ng, K.-W. (2022b). Pulsar and cosmic variances of pulsar timing-array correlation measurements of the stochastic gravitational wave background. *JCAP*, 11, 046.

  doi:10.1088/1475-7516/2022/11/046. arXiv: 2209.14834 [gr-qc]
- Palpal-latoc, C. J., Bernardo, R. C., & Vega, I. (2022). Testing time-delayed cosmology. *Eur. Phys. J. C*, 82(1148). 
  Ø doi:10.1140/epjc/s10052-022-11126-x. arXiv: 2111.10742 [astro-ph.CO]
- Bernardo, R. C., Said, J. L., Caruana, M., & Appleby, S. (2021a). Well-Tempered Minkowski Solutions in Teleparallel Horndeski Theory. 6 doi:10.1088/1361-6382/ac36e4. arXiv: 2108.02500 [gr-qc]
- Bernardo, R. C. (2021a). Gravitational wave signatures from dark sector interactions. *Phys. Rev. D*, 104(2), 024070. Odoi:10.1103/PhysRevD.104.024070. arXiv: 2103.02311 [gr-qc]
- Bernardo, R. C. (2021b). Inflationary quantum dynamics and backreaction using a classical-quantum correspondence. *Eur. Phys. J. C*, 81(11), 994. Odoi:10.1140/epjc/s10052-021-09781-7. arXiv: 2109.08508 [gr-qc]
- Bernardo, R. C. (2021c). Self-tuning kinetic gravity braiding: Cosmological dynamics, shift symmetry, and the tadpole. *JCAP*, 03, 079. Odo::10.1088/1475-7516/2021/03/079. arXiv: 2101.00965 [gr-qc]
- Bernardo, R. C., & Levi Said, J. (2021a). A data-driven Reconstruction of Horndeski gravity via the Gaussian processes. *JCAP*, 09, 014. Odoi:10.1088/1475-7516/2021/09/014. arXiv: 2105.12970 [astro-ph.CO]
- Bernardo, R. C., & Levi Said, J. (2021b). Towards a model-independent reconstruction approach for late-time Hubble data. *JCAP*, 08, 027. Odoi:10.1088/1475-7516/2021/08/027. arXiv: 2106.08688 [astro-ph.CO]
- Bernardo, R. C., Said, J. L., Caruana, M., & Appleby, S. (2021b). Well-tempered teleparallel Horndeski cosmology: a teleparallel variation to the cosmological constant problem. *JCAP*, 10, 078.

  Odoi:10.1088/1475-7516/2021/10/078. arXiv: 2107.08762 [gr-qc]

- Bernardo, R. C., & Vega, I. (2021). Stealth black hole perturbations in kinetic gravity braiding. *J. Math. Phys.*, 62(7), 072501. 6 doi:10.1063/5.0048929. arXiv: 2007.06006 [gr-qc]
- Bernardo, R. C., Celestial, J., & Vega, I. (2020). Stealth black holes in shift symmetric kinetic gravity braiding. *Phys. Rev. D*, 101(2), 024036. Ø doi:10.1103/PhysRevD.101.024036. arXiv: 1911.01847 [gr-qc]
- Bernardo, R. C., & Vega, I. (2019a). Hair-dressing Horndeski: An approach for obtaining hairy solutions in cubic Horndeski gravity. *Phys. Rev. D*, 99(12), 124049. Odoi:10.1103/PhysRevD.99.124049. arXiv: 1902.04988 [gr-qc]
- Bernardo, R. C., & Vega, I. (2019b). Tailoring cosmologies in cubic shift-symmetric Horndeski gravity. *JCAP*, 10, 058. 6 doi:10.1088/1475-7516/2019/10/058. arXiv: 1903.12578 [gr-qc]
- Bernardo, R. C. S., & Esguerra, J. P. H. (2018). Maximally-localized position, Euclidean path-integral, and thermodynamics in GUP quantum mechanics. *Annals Phys.*, 391, 293–311.

  6 doi:10.1016/j.aop.2018.02.015
- Bernardo, R. C. S., & Esguerra, J. P. H. (2017). Euclidean path integral formalism in deformed space with minimum measurable length. *J. Math. Phys.*, 58(4), 042103. 60 doi:10.1063/1.4979797
- Cruz, P. C. S., Bernardo, R. C. S., & Esguerra, J. P. H. (2017). Energy levels of a quantum particle on a cylindrical surface with non-circular cross-section in electric and magnetic fields. *Annals of Physics*, 379, 159–174. 6 doi:https://doi.org/10.1016/j.aop.2017.02.004
- Bernardo, R. C. S., & Esguerra, J. P. H. (2016a). Energy levels of one-dimensional systems satisfying the minimal length uncertainty relation. *Annals Phys.*, *373*, 521–531. *O* doi:10.1016/j.aop.2016.07.035
- Bernardo, R. C. S., & Esguerra, J. P. H. (2016b). Quantum scattering in one-dimensional systems satisfying the minimal length uncertainty relation. *Annals Phys.*, 375, 444–459.

  & doi:10.1016/j.aop.2016.10.022
- Bernardo, R. C., Esguerra, J. P., Vallejos, J. D., & Canda, J. J. (2015). Wind-influenced projectile motion. *European Journal of Physics*, 36(2), 025016. 6 doi:10.1088/0143-0807/36/2/025016
- Bernardo, R. C. S., & Esguerra, J. P. H. (2015b). Exactly Solvable Dynamical Models with a Minimal Length Uncertainty. *Few Body Syst.*, 56(4-5), 219–229. Odoi:10.1007/s00601-015-0978-8. arXiv: 1602.02240 [hep-th]
- Bernardo, R. C. S., & Palisoc, C. P. (2014). Wronskian method for bound state central force problem. *European Journal of Physics*, 35(3), 035024. *6* doi:10.1088/0143-0807/35/3/035024

# **Workshops & Invited Talks**

- **2023 Annual Meeting of the Physical Society of Taiwan (TPS2023)**, 16 18 January 2023, hosted by the National Cheng Kung University, Taiwan, Talk: "Stochastic gravitational wave background correlation signals in a pulsar timing array"
- 19th Rencontres du Vietnam 2023: Theory meeting experiments (TMEX-2023), 5 11 January 2023, hosted by the International Centre for Interdisciplinary Science Education, Quy Nhon, Vietnam, Talk: "Stochastic gravitational wave background correlations in a pulsar timing array"
- PTAfast: Finding the Galileon and other degrees of freedom in the nanohertz GW sky, 2 December 2022, Invited Talk (given virtually) at the CosPA (Cosmology and Particle Astrophysics) 2022 Symposium, Asia Pacific Center for Theoretical Physics, Korea
- Stochastic gravitational wave background phenomenology in a pulsar timing array, 27 October 2022, Invited Seminar at the Department of Physics, National Tsing Hua University, Taiwan

## **Workshops & Invited Talks (continued)**

- The 31st Workshop on General Relativity and Gravitation in Japan (JGRG31), 24 28 October 2022, virtual, hosted by the University of Tokyo, Japan, Talk: "Stochastic gravitational wave background phenomenology beyond Einstein"
- The stochastic gravitational wave background in a pulsar timing array, 6 October 2022, Invited Seminar at the Department of Physics, National Taiwan Normal University, Taiwan
- The stochastic gravitational wave background in a pulsar timing array, 4 October 2022, Invited Seminar at the Department of Electrophysics, National Yang Ming Chiao Tung University, Taiwan
- NCTS The Future is Illuminating, 28 30 June 2022, virtual, hosted by the National Center for Theoretical Sciences Physics Division, Hsinchu Hub, Taiwan, Talk: "Beyond Einstein phenomenology in the nanohertz gravitational wave sky"
- Quantum Field Theory in Curved Spacetimes Workshop, 23 27 May 2022, virtual, Talk: "Backreaction of modes on inflationary dynamics through a classical-quantum correspondence"
- **Self-tuning phenomenology through degeneracy and beyond**, 29 March 2022, Invited Seminar at the Department of Physics, National Taiwan Normal University, Taiwan
- Asia-Pacific School and Workshop on Gravitation and Cosmology 2022, 19 22 March 2022, virtual, hosted by the Department of Physics, Soochow, Taiwan and GSROC (Taiwan), Talk: "Selftuning beyond degeneracy through the cosmic tadpole"
- The cosmological constant problem, Fab Four, and well-tempered cosmology, 18 February 2022, Invited Seminar at the Institute of Physics, Academia Sinica, Taiwan
- Gravitational wave signatures from dark sector interactions, 27 December 2021, Invited Seminar at the National Center for Theoretical Sciences Physics Division, National Taiwan University, Taiwan
- The 30th Workshop on General Relativity and Gravitation in Japan (JGRG30), 6 10 December 2021, virtual, hosted by the Waseda University, Japan, Talk: "Towards well-tempered dark energy and teleparallel gravity"
- LeCosPA 4th International Symposium Unity of Physics From Plasma Wakefields to Black Holes, 29 November 3 December 2021, hosted by the Leung Center for Cosmology and Particle Astrophysics, National Taiwan University, Talk: "Progress on well-tempered cosmology: new teleparallel extensions and observational status"
- **Brookhaven Forum: Opening New Windows to the Universe (BF2021)**, 3 5 November 2021, virtual, hosted by the Brookhaven National Laboratory, Talk: "Towards a model-independent reconstruction approach for late-time Hubble data"
- The dark Universe: Theory and data assemblies, 20 22 October 2021, Invited Talk (given virtually) at the Proceedings of the 39th Samahang Pisika ng Pilipinas Physics Conference, Physics Society of the Philippines
- 8th Korea-Japan workshop on Dark Energy, 18 22 October 2021, virtual, hosted by the Yukawa Institute for Theoretical Physics, Kyoto University, Japan, Talk: "Towards well-tempered dark energy models"
- AAPPS-DACG Workshop 2021 on Astrophysics, Cosmology and Gravitation, 4 8 October 2021, virtual, hosted by the Asia Pacific Center for Theoretical Physics, Korea, Talk: "A data-driven reconstruction of Horndeski gravity using late-time Hubble data"
- Black Holes Inside and Out (BHIO2021), 27 September 1 October 2021, virtual, hosted by the Tokyo Institute of Technology and the Yukawa Institute of Theoretical Physics, Japan and the Florida Space Institute, US, Poster: "Gravitational wave signatures from dark sector interactions"
- Alternative Gravities and Fundamental Cosmology (ALTECOSMOFUN'21), 6 10 September 2021, virtual, hosted by the Szczecin Cosmology Group, Institute of Physics, University of Szczecin, Poland, Talk: "A data-driven reconstruction of Horndeski gravity using late-time Hubble data"

### **Workshops & Invited Talks (continued)**

- Iberian Cosmology Meeting (IberiCOS 2021), 29 March April 1 2021, virtual, hosted by the University of Coimbra and Instituto Superior Técnico, University of Lisbon, Portugal, Talk: "New scaling solutions in coupled vector dark energy"
- International Webinar on Recent Developments in Cosmology and Modified Gravity (RDCM-2021), 9 11 March 2021, virtual, hosted by the Department of Mathematics, BITS-Pilani, Hyderabad Campus, India, Talk: "Gravitational waves from dark sector interactions"
- SIGRAV International School 2021: Gravity of Compact Astrophysical Objects and Gravitational Waves, 1 5 February 2021, virtual, hosted by the Italian Society of General Relativity and Gravitation, Italy
- IV Joint ICTP-Trieste/ICTP-SAIFR School on Cosmology: Challenges for the Standard Cosmological Model, 18 29 January 2021, virtual, hosted by IFT-UNESP, São Paulo, Brazil
- The 29th Workshop on General Relativity and Gravitation in Japan (JGRG29), 25 29 November 2019, Kobe University, Japan, Talk: "Hairy black holes in kinetic gravity braiding"
- 2019 YITP Asian-Pacific Winter School and Workshop on Gravitation and Cosmology, 11 15 February 2019, Yukawa Institute for Theoretical Physics, Kyoto University, Japan, Poster: "New solutions in Horndeski theory"
- ICTP Summer School on Cosmology 2018, 18 29 June 2018, Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

## **Conference Proceedings**

#### Samahang Pisika ng Pilipinas (Physics Society of the Philippines)

- Baybay, J. A. B., Bernardo, R. C., & Vega, M. F. I. (2020). Scattering of nonlinear bosonic fields: A case study in superradiance. In *Proceedings of the samahang pisika ng pilipinas* (Vol. 38, SPP-2020-5A-05). Retrieved from 6 https://proceedings.spp-online.org/article/view/SPP-2020-5A-05
- Bernardo, R. C., Angeles, J. M., & Vega, M. F. I. (2020). Cosmological dynamics in a self-tuning cubic horndeski theory. In *Proceedings of the samahang pisika ng pilipinas* (Vol. 38, SPP-2020-1E-05). Retrieved from **6** https://proceedings.spp-online.org/article/view/SPP-2020-1E-05
- Celestial, J. d. L., Bernardo, R. C. S., & Vega, M. F. I. G. (2019). Electrically-charged black holes in horndeski theory. In *Proceedings of the samahang pisika ng pilipinas* (Vol. 37, SPP-2019-3C-02). Retrieved from **6** https://proceedings.spp-online.org/article/view/SPP-2019-3C-02
- Villanueva, J. A. N., Bernardo, R. C. S., & Vega, M. F. I. G. (2019). Gravitational radiation from extreme-mass ratio inspirals in bald kinetic gravity braiding. In *Proceedings of the samahang pisika ng pilipinas* (Vol. 37, SPP-2019-3C-04). Retrieved from

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- Bernardo, R. C., & Vega, M. F. I. (2018). No-go theorems in cubic sector of shift-symmetric horndeski gravity. In *Proceedings of the samahang pisika ng pilipinas* (Vol. 36, SPP-2018-1D-01). Retrieved from <a href="https://proceedings.spp-online.org/article/view/SPP-2018-1D-01">https://proceedings.spp-online.org/article/view/SPP-2018-1D-01</a>
- Bernardo, R. C. S., & Esguerra, J. P. H. (2015a). Energy levels of a quantum particle on a corrugated tube in a uniform electric field. In *Proceedings of the samahang pisika ng pilipinas* (Vol. 33, SPP-2015-PB-43). Retrieved from **6** https://proceedings.spp-online.org/article/view/1249
- Bernardo, R. C. S., & Esguerra, J. P. H. (2014). Tunneling through rectangular double barrier potential systems in quantum mechanics with minimal length uncertainty. In *Proceedings of the samahang pisika ng pilipinas* (Vol. 32, SPP2014-3B-05). Retrieved from <a href="https://proceedings.spp-online.org/article/view/1840">https://proceedings.spp-online.org/article/view/1840</a>

Bernardo, R. (2013). Effect of transverse uniform electric field on spinless quantum particle confined on the surface of an elliptic cylinder. In *Proceedings of the samahang pisika ng pilipinas* (Vol. 31, SPP2013-PA-9). Retrieved from

♦ https://proceedings.spp-online.org/article/view/SPP2013-PA-9

#### Skills

Languages | English, Filipino

Coding Python, Mathematica, LaTeX

Misc. Academic research, teaching, training, consultation, LaTeX typesetting and publishing

### **Teaching**

Lecturer Particle Physics, Thermodynamics, Relativity, and Quantum Mechanics for Engineering and Physics Majors

Lab Elementary Mechanics, Thermodynamics, and Modern Physics for Engineering and Science Students

Grader Mechanics, Electromagnetism, Quantum Theory, Statistical Mechanics, Solid State Physics, and General Gelativity for Undergraduate and Graduate Students

### **Admin**

Organizer HEP Seminar, August 2022–January 2023, Institute of Physics, Academia Sinica

HEP Journal Club, February–July 2022, Institute of Physics, Academia Sinica

Head Wellness Committee, A.Y. 2019-2020, National Institute of Physics, University of the Philippines Diliman

Modern Physics Course Group, A.Y. 2018-2019, National Institute of Physics, University of the Philippines Diliman

Elementary Mechanics Lab Course Group, A.Y. 2017-2018, National Institute of Physics, University of the Philippines Diliman

Member Socials Committee, A.Y. 2015-2016, National Institute of Physics, University of the Philippines Diliman

## Miscellaneous Experience

#### Service to the Community

Referee Physical Review Journals, Classical and Quantum Gravity, Physics of the Dark Universe, Chinese Journal of Physics, Scientific Reports, Proceedings of the Physics Society of the Philippines

Editor Topical Editor in Theoretical Physics, Proceedings of the Physics Society of the Philippines

### **Awards and Achievements**

2020 Most Outstanding Ph.D. Graduate, College of Science, UPD

**Edgardo Gomez Award for Outstanding Ph.D. Graduate**, College of Science, UPD

**Excellence in Graduate Studies**, College of Science, UPD

2017 Most Outstanding M.S. Graduate, College of Science, UPD

## Miscellaneous Experience (continued)

2016	Gawad Direktor bilang Natatanging Guro sa Laboratorio, National Institute of
	Physics, UPD
2015	Leticia Shahani Award for Best Undergraduate Thesis, College of Science, UPD

Magna Cum Laude, College of Science, UPD

2012 – 2015 Jose Maria Feliciano Undergraduate Scholar, College of Science, UPD

2010 – 2015 College and University Scholar, College of Science, UPD

## References

#### **Kin-Wang Ng**

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#### Ian Vega

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#### **Jackson Levi Said**

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