Hunting for new physics in the primordial Universe

Wang, D.-G.

List of publications

- Oksana Iarygina, Evangelos I. Sfakianakis, Dong-Gang Wang, Ana Achúcarro, *Multi-field inflation and preheating in asymmetric α-attractors*, arXiv: 2005.00528.
- Dong-Gang Wang, *On the inflationary massive field with a curved field manifold*, *JCAP* 2001 (2020) no.01, 046.
- Ana Achúcarro, Gonzalo Palma, Dong-Gang Wang, Yvette Welling, *Origin of ultra-light fields during inflation and their suppressed non-Gaussianity*, arXiv: 1908.06956.
- Yi-Fu Cai, Chao Chen, Xi Tong, Dong-Gang Wang, Sheng-Feng Yan, *When Primordial Black Holes from Sound Speed Resonance Meet a Stochastic Background of Gravitational Waves*, *Phys. Rev.* D **100**, 043518 (2019).
- Ana Achúcarro, Ed Copeland, Oksana Iarygina, Gonzalo Palma, Dong-Gang Wang, Yvette Welling, *Shift-symmetric orbital inflation: single field or multi-field?*, *Phys. Rev.* D *Rapid Communications*, **102**, 021302(R) (2020).
- Oksana Iarygina, Evangelos I. Sfakianakis, Dong-Gang Wang, Ana Achúcarro, *Universality and scaling in multi-field α-attractor preheating*, *JCAP* 1906 (2019) no.06, 027.
- Yi-Fu Cai, Xi Tong, Dong-Gang Wang, Sheng-Feng Yan, *Primordial black holes from sound speed resonance during inflation*, *Phys.Rev.Lett.* **121**, 081306 (2018).
- Andrei Linde, Dong-Gang Wang, Yvette Welling, Yusuke Yamada, Ana Achúcarro, *Hypernatural Inflation*, *JCAP* 1807 (2018) no.07, 035.

- Yi-Fu Cai, Xingang Chen, Mohammed Hossein Namjoo, Misao Sasaki, Dong-Gang Wang, Ziwei Wang, *Revisiting non-Gaussianity from non-attractor inflation models*, *JCAP* 1805 (2018) no.05, 012.

- Ana Achúcarro, Renata Kallosh, Andrei Linde, Dong-Gang Wang, Yvette Welling, *Universality of multi-field alpha-attractors*, *JCAP* 1804 (2018) no.04, 028.

- Yu-Bin Li, Jerome Quintin, Dong-Gang Wang and Yi-Fu Cai, *Matter bounce cosmology with a generalized single field: non-Gaussianity and an extended no-go theorem*, *JCAP* 1703 (2017) no.03, 013.

- Yi-Fu Cai, Antonino Marciano, Dong-Gang Wang and Edward Wilson-Ewing, *Bouncing cosmologies with dark matter and dark energy*, *Universe* **3**, 1 (2017).

- Yi-Fu Cai, Jinn-Ouk Gong, Dong-Gang Wang and Ziwei Wang, *Features from the non-attractor beginning of inflation*, *JCAP* 1610 (2016) no.10, 017.

- Fa Peng Huang, Youping Wan, Dong-Gang Wang, Yi-Fu Cai and Xinmin Zhang, *Hearing the echoes of electroweak baryogenesis with gravitational wave detectors*, *Phys. Rev.* D *Rapid Communications* **94**, 041702(R) (2016).

- Yi-Fu Cai, Francis Duplessis, Damien Easson and Dong-Gang Wang, *Search for a matter bounce cosmology with low redshift observations* , *Phys. Rev.* D **93**, 043546 (2016).

- Dong-Gang Wang, Yang Zhang and J. Chen, *Vacuum and Gravitons of Relic Gravitational Waves, and Regularization of Spectrum and Energy-Momentum Tensor*, *Phys. Rev.* D **94**, 044033 (2016).

- Dong-Gang Wang, Yi-Fu Cai, W. Zhao and Y. Zhang, *Scale-dependent CMB power asymmetry from primordial speed of sound and a generalized δN formalism*, *JCAP* 1602 (2016) no.02, 019.

Curriculum Vitae

I was born in 1991, in Guangrao in Shandong Province, a county town in East China. There, I attended primary school and middle school, and spent a lot time reading and dreaming, which in some sense planted the seeds for my interests in physics and astronomy.

In 2006, I left my hometown and went to the Shengli No.1 High School in the city of Dongying. In 2009, I went to China University of Petroleum, Beijing. This turned out to be a poor decision, as engineering was not my passion, while my dream of physics and astronomy kept calling me. So, later, I decided to pursue a new career towards the stars above, instead of the oil beneath the ground. After my undergraduate study I earned admission to the University of Science and Technology of China (USTC), being exempted from the postgraduate entrance examination.

From 2013, I did my master study in the Department of Astronomy at USTC, and started to work on cosmology under the supervision of Prof. Yang Zhang. I became intrigued by the question how galaxies originated from quantum fluctuations in the very early Universe, and devoted myself to this research area. In 2015, I met and started my collaborations with Prof. Yi-Fu Cai, who joined USTC as a new faculty member at that time and sparked my interest in the modern frontier of cosmology.

In 2016, I obtained a de Sitter Fellowship from Leiden University and came to the Netherlands for my PhD. There I became affiliated with Leiden Observatory and Lorentz Institute for Theoretical Physics, and started conducting theoretical research in primordial cosmology under the supervision of Prof. Ana Achúcarro. My PhD training motivated me to systematically look into high energy physics effects in consistent theories of cosmic inflation and also focus on their detectability in astronomical observations.

From October 2020, I will be a postdoctoral researcher in the theoretical cosmology group of Dr. Enrico Pajer in the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge.

Acknowledgements

The four year's journey for my PhD in Leiden is coming to an end, and I cannot imagine I would have gotten this far without the support of many people.

Ana, I won't simply say "thank you" here, since it cannot express how grateful I truly am. To me, what you have done in the past 4 years is much more than mentoring a PhD student on specific projects. Academically, you showed me how to figure out physically important problems and develop exciting ideas with scientific rigor. Because of your support, I was also able to get in touch with so many brilliant cosmologists, and step on an upward trajectory for career. Psychologically, you have helped me through the darkest moments in my PhD life, and guided me to find the strength within myself. It is hard to describe how tremendously you have influenced me on the way to become a good cosmologist and a better person. No doubt you are the best supervisor that I could have hoped for.

Yifu, it was fantastic to keep collaborating with you and your group at USTC even after I had graduated. I really appreciate your generous and long-term support for my research, career development and life, which has turned out to be very important for my PhD period. Needless to say, I was very fortunate to meet you when I started my journey in cosmology.

I would like to thank my collaborators during my PhD: Ed Copeland, Chao Chen, Xingang Chen, Oksana Iarygina, Renata Kallosh, Yubin Li, Andrei Linde, Mohammed Hossein Namjoo, Gonzalo Palma, Guilherme Pimentel, Jerome Quintin, Misao Sasaki, Evangelos Sfakianakis, Xi Tong, Ziwei Wang, Yvette Welling, Yusuke Yamada, Sheng-Feng Yan. There was a lot of fun in our collaborations, and it would be impossible to finish those cool projects without you!

I am also grateful to my colleagues at the Leiden Observatory and the Lorentz Institute for creating a warm environment. Many thanks, Koen, for your kind and continuous support. Special thanks to the Leiden cosmology

gang members Yashar, Guadalupe, Omar, Matteo, Simone, Valeri, and also my office mates Margot, Vivianni, Alessandro and Shunsheng. Thank you, Yvette, for helping me with the Dutch summary of this thesis. Certainly I should also acknowledge the efficient and friendly administrative support from Marjan, Alexandra, Evelijn and Fran.

Meanwhile it was a great pleasure to be part of the Dutch theoretical cosmology community, and I really enjoyed our monthly THC meetings. Special thanks to Horng Sheng Chia, Perseas Christodoulidis, Garret Goon, Leihua Liu, Enrico Pajer and Diederik Roest. The discussions with you have been illuminating and helpful. I am also indebted to many other cosmology colleagues outside the Netherlands, including but not limited to Vicente Atal, Andrea Fuster, Cristiano Germani, Jinn-Ouk Gong, Bin Hu, Chunshan Lin, Sebastien Renaux-Petel, Krzysztof Turzynski, Yi Wang, Alexander Westphal and Edward Wilson-Ewing.

Life is full of ups and downs, and it would be difficult to handle them without the company of friends outside of cosmology, thus I would like to express my sincere gratitudes to Chao Fan, Qi Zhang, Yuanhao Guo, Junjie Mao, Zhihong You, Shizhe Zhang, Xuechen Zheng, Fangyou Gao, Mingyuan Wang, Zhenfeng Sheng, Feng Jiang, Yun Tian, Chunmiao Ye, Yuhan Sun, Xuxing Lu, Jiangnan Ding, Junxiang Yao, Yu Liu, Zujia Lu, Peng Cheng, Yongliang Hao, Maolin Zhang, members of the Leiden Science China community and USTC Alumni Association in the Netherlands, and many others.

At last I am deeply indebted to my family, especially to my parents. Your unconditional love is always the solid backing for me and the invaluable treasure in my life. This thesis is dedicated to you.