

# Anna I. (Ijjas) Rosenzweig

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## Experience

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### Principal Investigator

Simons Foundation

09/2017 - present

New York, NY

- Invented mathematical and computational techniques to construct and assess novel theories of the early universe.
- Attracted long-term funding (\$ 2M) for a new research initiative.
- Recruited, mentored and trained team members at NYU, Max Planck, Harvard and Columbia (see below).
- Developed strategic plan and managed budget.
- Effectively communicated results to the scientific community and the public.

### Senior Research Scientist

Department of Physics, New York University

01/2022 - present

New York, NY

- Designed and implemented research projects involving analytic modeling, numerical analysis, computer simulation and data visualization.

### Research Group Leader | Professor of Physics

Albert Einstein Institute, Max Planck Society

09/2019 - 12/2021

- Inaugural awardee of the Lise Meitner Excellence Program.
- Attracted and managed a multi-million Euro research budget.
- Established a new theory research group to complement ongoing experimental efforts.
- Taught introductory physics courses and volunteered in public outreach.

### Simons Research Associate

Institute of Theory and Computation, Harvard University

09/2018 - 08/2019

Cambridge, MA

### Associate Research Scientist

Center for Theoretical Physics, Columbia University

09/2017 - 08/2018

New York, NY

### Postdoctoral Fellow

Center for Theoretical Science, Princeton University

09/2014 - 08/2017

Princeton, NJ

- Research in theoretical and computational cosmology.
- Awarded the inaugural John A. Wheeler Fellowship (2016-17) for excellence in research.

## Education

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### PhD, Theoretical Physics

Humboldt University

2014

Berlin, Germany

- With distinction: *magna cum laude*
- Thesis title: *Observational and Theoretical Issues in Early-Universe Cosmology*
- Thesis research (2012-14) at Harvard and Princeton Universities with a Fritz Thyssen Fellowship.
- Results featured in several science media including New Scientist and Quanta Magazine.

### PhD, Philosophy of Quantum Mechanics

Ludwig Maximilians University

2010

Munich, Germany

- With distinction: *summa cum laude*
- Thesis title: *Der Alte mit dem Würfel. Ein Beitrag zur Metaphysik der Quantenmechanik.*  
(eng. *The Old One with the Dice: A Contribution to the Metaphysics of Quantum Mechanics*)
- Awarded with the Dissertation Prize of Munich University (2011) and the Research Prize of the European Society for the Study of Science and Theology (2012).

### B.Sc., Mathematics, Physics

Ludwig Maximilians University

2008

Munich, Germany

## Publications

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- Articles** 32 papers (5 single-authored, 19 first-authored), all published in peer-reviewed journals
- Books** 1 award-winning academic book, 1 forthcoming textbook
- Presentations** over 100 presentations at conferences, meetings, universities and research institutes worldwide

## Awards

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- 2022 **Emmy Noether Visiting Fellowship**, Perimeter Institute for Theoretical Physics
- 2019 **Principal Investigator**, New Directions in Gravitational Theory and Cosmology, Simons Foundation
- 2019 **Lise Meitner Excellence Group Award**, Max Planck Society
- 2017 **Principal Investigator**, Origins of the Universe Initiative, Simons Foundation
- 2016 **John A. Wheeler Fellowship**, Princeton Center for Theoretical Science
- 2014 **Honorable Research Fellowship**, Princeton Center for Theoretical Science
- 2013 **Graduate Research Fellowship**, Rutgers-Columbia Philosophy & Cosmology Initiative
- 2012 **Graduate Research Fellowship**, Fritz Thyssen Foundation
- 2011 **Doctoral Dissertation Award**, Ludwig Maximilians University
- 2009 **Scholarship for outstanding academic achievement**, Ludwig Maximilians University

## Service to the profession

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- conference, workshop and seminar organization**, 8 international workshops and conferences in Princeton, NJ, Cambridge, MA, New York, NY, Copenhagen, DK, Salzburg, AT, Venice, IT, Munich, DE; chaired 6 term-long seminars in Princeton, NJ and New York, NY
- 2014-22
- teaching**, two advanced graduate courses and two introductory undergraduate courses in physics, four undergraduate courses in philosophy of science
- 2012-21
- regular referee**, Nature, Physical Review Letters, Physical Review D, Physics Letters B, Journal of Cosmology and Astroparticle Physics, Journal of High Energy Physics, Classical and Quantum Gravity, Annals of Physics, Monthly Notices of the Royal Astronomical Society, Foundations of Physics, The European Physical Journal C, Mathematical Reviews, Modern Physics Letters A, Physics of the Dark Universe, Fortschritte der Physik
- 2014-present
- regular grant reviewer**, 'la Caixa' Foundation (Spain), National Science Foundation (Poland), John Templeton Foundation (USA)
- 2017-present

## Languages

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- English** Full professional proficiency
- German** Full professional proficiency
- Hungarian** Native

## Skills

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- Soft skills** Critical and creative thinking, Analytical problem solving, Organized and detail-oriented;
- Technical skills** Numerical analysis and computational modeling, Coding (Fortran, Python, Mathematica), Data analysis, Machine learning, Data visualization;
- Communication** Clear and effective presentation, Scientific writing;
- Leadership** Project management, Cross-functional teamwork, Mentoring and training

**References available upon request.**

## List of Publications

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### Journal articles:

- **A. Ijjas**. *Slow Contraction and the Weyl Curvature Hypothesis*, arXiv:2304.10030.
- D. Garfinkle, **A. Ijjas**, P. J. Steinhardt. *Initial conditions problem in cosmological inflation revisited*, Phys. Lett. B 843 (2023) 138028, arXiv:2304.12150
- **A. Ijjas**. *Gauge/frame invariant variables for the numerical relativity study of cosmological spacetimes*, JCAP 06 (2023) 061, arXiv:2304.07616.
- T. Kist, **A. Ijjas**. *The robustness of slow contraction and the shape of the scalar field potential*, JCAP 8 (2022) 046, arXiv:2205.01519.
- C. Andrei, **A. Ijjas**, P. J. Steinhardt. *Rapidly Descending Dark Energy and the End of Cosmic Expansion*, PNAS 119 (2022) e2200539119, arXiv:2201.07704.
- **A. Ijjas**. *Numerical Relativity as a New Tool for Fundamental Cosmology*, Physics 4 (2022) 301-314, (invited review article for the special issue *New Directions in Primordial Cosmology*), arXiv:2201.03752.
- **A. Ijjas**, P. J. Steinhardt. *Entropy, black holes, and the new cyclic universe*, Phys. Lett. B 824 (2022) 136823, arXiv:2108.07101.
- **A. Ijjas**, F. Pretorius, P.J. Steinhardt, D. Garfinkle. *Dynamical attractors in contracting spacetimes dominated by kinetically coupled scalar fields*, JCAP 12 (2021) 030, arXiv:2109.09768.
- **A. Ijjas**, F. Pretorius, P.J. Steinhardt, A. Sullivan. *The Effects of Multiple Modes and Reduced Symmetry on the Rapidity and Robustness of Slow Contraction*, Phys. Lett. B 820 (2021) 136490, arXiv:2104.12293.
- **A. Ijjas**, A. Sullivan, F. Pretorius, P.J. Steinhardt, W.G. Cook. *Ultralocality and Slow Contraction*, JCAP 06 (2021) 013, arXiv:2103.00584.
- **A. Ijjas**, R. Kolevatov. *Nearly scale-invariant curvature modes from entropy perturbations during graceful exit*, Phys. Rev. D 103 (2021) L101302, arXiv:2102.03818.
- **A. Ijjas**, R. Kolevatov. *Sourcing curvature modes with entropy perturbations in non-singular bouncing cosmologies*, JCAP 06 (2021) 012, arXiv:2012.08249.
- W.G. Cook, I.A. Glushchenko, **A. Ijjas**, F. Pretorius, P.J. Steinhardt. *Supersmoothing through Slow Contraction*, Phys. Lett. B 808 (2020) 135690, arXiv:2006.01172.
- **A. Ijjas**, W.G. Cook, F. Pretorius, P.J. Steinhardt, E.Y. Davies. *Robustness of slow contraction to cosmic initial conditions*, JCAP 08 (2020) 030; featured in *Quanta Magazine* August 4, 2020; arXiv:2006.04999.
- P. Ade et al. (including **A. Ijjas**). *The Simons Observatory: Astro2020 Decadal Project Whitepaper*, Bull.Am.Astron.Soc. 51 (2019) 147, arXiv:1907.08284.
- G. Rocha et al. (including **A. Ijjas**). *Astro2020 APC White Paper: The need for better tools to design future CMB experiments*, Bull.Am.Astron.Soc. 51 (2019) 7, 221.
- **A. Ijjas**, P. J. Steinhardt. *A new kind of cyclic universe*, Phys. Lett. B 795 (2019) 666-672, arXiv:1904.08022.
- P. Ade et al. (including **A. Ijjas**). *The Simons Observatory: Science goals and forecasts*, JCAP 02 (2019) 056, arXiv:1808.07445.
- **A. Ijjas**, F. Pretorius, P. J. Steinhardt. *Stability and the Gauge Problem in Non-Perturbative Cosmology*, JCAP 01 (2019) 015, arXiv:1809.07010.
- **A. Ijjas**, P. J. Steinhardt. *Bouncing Cosmology made simple*, Class. Quantum Grav. 35 (2018) 135004, as 'editor's suggestion,' arXiv:1803.01961.
- **A. Ijjas**. *Space-time slicing in Horndeski theories and its implications for non-singular bouncing solutions*, JCAP 02 (2018) 007; featured in *Quanta Magazine* January 31, 2018; *Columbia Magazine* Spring/Summer 2018, arXiv:1710.05990.
- **A. Ijjas**. *Cyclic completion of the anamorphic universe*, Class. Quantum Grav. 35 (2018) 075010, arXiv:1610.02752.
- **A. Ijjas**, P. J. Steinhardt. *Fully stable cosmological solutions with a non-singular classical bounce*, Phys. Lett. B 764 (2017) 289-294, arXiv:1609.01253.
- **A. Ijjas**, P. J. Steinhardt. *Classically stable non-singular cosmological bounces*, Phys. Rev. Lett. 117 (2016) 121304, arXiv:1606.08880.
- **A. Ijjas**, J. Ripley, P. J. Steinhardt. *NEC violation in mimetic cosmology revisited*, Phys. Lett. B 760 (2016) 132-138, arXiv:1604.08586.
- **A. Ijjas**, P. J. Steinhardt. *Implications of Planck2015 for inflationary, ekpyrotic and anamorphic bouncing cosmologies*, Class. Quantum Grav. 33 (2016) 044001, arXiv:1512.09010. [invited contribution]
- **A. Ijjas**, P. J. Steinhardt. *The anamorphic universe*, JCAP 10 (2015) 001, arXiv:1507.03875.
- A. Levy, **A. Ijjas**, and P. J. Steinhardt. *Scale-invariant perturbations in ekpyrotic cosmologies without fine-tuning of initial conditions*, Phys. Rev. D. 92 (2015) 063524, arXiv:1506.01011.
- **A. Ijjas**, J.-L. Lehners, and P. J. Steinhardt. *A general mechanism for producing scale-invariant perturbations and small non-Gaussianity in ekpyrotic models*, Phys. Rev. D. 89 (2014) 123520, arXiv:1404.1265.
- **A. Ijjas**, P. J. Steinhardt, and A. Loeb. *Inflationary schism*, Phys. Lett. B 736 (2014), pp. 142-146, arXiv:1402.6980.
- **A. Ijjas**, P. J. Steinhardt, and A. Loeb. *Scale-free primordial cosmology*, Phys. Rev. D 89 (2014) 023525, arXiv:1309.4480.
- **A. Ijjas**, P. J. Steinhardt, and A. Loeb. *Inflationary paradigm in trouble after Planck2013*, Phys. Lett. B 723 (2013) 261-266; featured in *New Scientist* 2937 (2013) 38-41 and *Quanta Magazine* 01/30, 2015.

**Books:**

- **A. Ijjas** & P.J. Steinhardt. *Rethinking Cosmology* (under contract with PUP, to appear in 2024).
- **A. Ijjas**. *Der Alte mit dem Würfel. Ein Beitrag zur Metaphysik der Quantenmechanik*, Goettingen: Vandenhoeck & Ruprecht 2011, pp. 223. [in German, English title: The old one with the dice: a contribution to the metaphysics of quantum mechanics]

**Popular articles:**

- **A. Ijjas**. What if there was no big bang?, *New Scientist*, August 17, 2019. [invited feature article]
- **A. Ijjas**, P.J. Steinhardt, A. Loeb. Pop goes the universe, *Scientific American*, February 1, 2017. [invited feature article]
- **A. Ijjas**, P.J. Steinhardt. Do we live in an anamorphic universe? *PBS NOVA: The Nature of Reality* 01/2016. [invited feature article]

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