

# Anirban Roy

[www.anirbanroy.in](http://www.anirbanroy.in)

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## PERSONAL DATA

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501 Space Science Building,  
Department of Astrophysics and Cosmology  
Cornell University,  
Ithaca, NY, USA 14853

E-mail: [ar689@cornell.edu](mailto:ar689@cornell.edu)  
Phone: (+1) 6072621190  
Skype: galpogujob  
Citizenship: Indian  
Date of Birth: March 17, 1993

## PRESENT POSITION

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OCT 2019- PRESENT | *Research Associate (Postdoctoral Fellow)*  
Cornell Center for Astrophysics and Planetary Science  
Cornell University, Ithaca, USA

## EDUCATION

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OCT 2015- SEP 2019 | *PhD cum laude student in Astrophysics*  
SISSA/ ISAS- International School for Advanced Studies, Trieste  
Title: Probing patchy reionization via CMB, LSS and their cross-correlations  
Supervisors: Carlo Baccigalupi, Andrea Lapi, and David Spergel

SEP 2013- AUG 2015 | *Master Degree in Physics*  
University of Burdwan, Burdwan, India  
Master Thesis: Secondary Anisotropies in Cosmic Microwave Background  
Supervisor: Sarbeswar Chaudhuri

AUG 2010- JUL 2013 | *Bachelor Degree in Physics*  
Asutosh College, Kolkata, India

## WORK EXPERIENCE

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MAY 2018- AUG 2018 | *Visiting Student*  
Kavli Institute for Cosmology, University of Cambridge, UK  
Project Title: The study of B-mode signal from patchy reionization and contamination on primordial B mode spectra  
Collaborators: Girish Kulkarni, Daan Meerburg, Anthony Challinor, and Martin Haehnelt

JAN 2014- MAY 2015 | *Project Student*  
Presidency University, India  
Project Title: Modelling Sunyaev Zeldovich Effect in Active Galaxies  
Supervisor: Suchetana Chatterjee

## RESEARCH INTEREST

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**Cosmic Microwave Background (CMB):** secondary anisotropies in CMB by lensing, reionization and Sunyaev-Zeldovich effect, imprints of non-Gaussianity in CMB, cross correlation studies with multiple tracers.

**Interface of Astrophysics and Cosmology:** line intensity mapping, redshifted 21-cm signal, star formation history in high redshift galaxies.

## PUBLICATIONS

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7) "Constraining reionization with the first measurement of the CMB optical depth fluctuation – Compton-y cross-correlation" Toshiya Namikawa, **Anirban Roy**, Blake Sherwin, Nicholas Battaglia, and David Spergel, PRD, Phys.Rev.D 104 (2021) 6, 063514, [[arXiv:2102.00975](https://arxiv.org/abs/2102.00975)]

6) "The correlation of high-redshift galaxies with the thermal Sunyaev-Zel'dovich effect traces reionization" Eric J. Baxter, Lewis Weinberger, Martin Haehnelt, Vid Irsic, Girish Kulkarni, Shivam Pandey, **Anirban Roy**, MNRAS, 501, 4, 2021, 6215, [[arXiv:2006.09742](https://arxiv.org/abs/2006.09742)]

5) "Revised estimates of CMB B-mode polarization induced by patchy reionization", **Anirban Roy**, Girish Kulkarni, P. Daniel Meerburg, Anthony Challinor, Carlo Baccigalupi, Andrea Lapi, Martin G. Haehnelt, JCAP 01 (2021), 003, [[arXiv:2004.02927](https://arxiv.org/abs/2004.02927)]

- 4) "Detectability of the  $\tau - 21cm$  cross-correlation: a tomographic probe of patchy reionization", **Anirban Roy**, Andrea Lapi, David Spergel, Carlo Baccigalupi, JCAP 3 (2020), 62, [[arXiv:1904.02637](#)]
- 3) "Cosmology with low-redshift observations: No signal for new physics" Koushik Dutta, **Anirban Roy**, Ruchika, Anjan A. Sen, M.M. Sheikh-Jabbari, 2019, PRD, 100, 103501, [[arXiv:1808.06623](#)]
- 2) "Beyond  $\Lambda$ CDM with Low and High Redshift Data: Implications for Dark Energy", Koushik Dutta, **Anirban Roy**, Ruchika, Anjan A. Sen, M.M. Sheikh-Jabbari, 2020, GRG, 52, 15, [[arXiv:1908.07267](#)]
- 1) "Observing Patchy Reionization With Future CMB Polarization Experiments", **Anirban Roy**, Andrea Lapi, David Spergel, Carlo Baccigalupi, 2018, JCAP, 5, 014 [[arXiv:1801.02393](#)]

#### Other Contribution:

- 4) "CCAT-prime Collaboration: Science Goals and Forecasts with Prime-Cam on the Fred Young Submillimeter Telescope", Aravena et al. (including Anirban Roy), July, 2021 submitted in APJ, [[arXiv:2008.12619](#)]
- 3) "CMB-S4: Forecasting Constraints on Primordial Gravitational Waves", Kevork Abazajian et. al, including Anirban Roy, August, 2020, submitted in APJ, [[arXiv:2008.12619](#)]
- 2) "CMB-S4 Science Case, Reference Design, and Project Plan", Kevork Abazajian et. al, including Anirban Roy, July, 2019, [[arXiv:1907.04473](#)]
- 1) "The Simons Observatory: Science goals and forecasts", Peter Ade et. al, including Anirban Roy, 2019, JCAP, 56, [[arXiv:1808.07445](#)]

#### WHITE PAPER/ PROCEEDINGS

- 3) "CMB-S4 Decadal Survey APC White Paper", Kevork Abazajian et. al, Bull.Am.Astron.Soc. 51 (2019) no.7, 209 [[arXiv:1908.01062](#)]
- 2) "The Simons Observatory: Astro2020 Decadal Project Whitepaper", Simons Observatory Collaboration, Bull.Am.Astron.Soc. 51 (2019) 147, [[arXiv:1907.08284](#)]
- 1) "Unique Probes of Reionization with the CMB: From the First Stars to Fundamental Physics", Marcelo Alvarez, Cora Dvorkin, James Aguirre, Nicholas Battaglia, Tzu-Ching Chang, Simone Ferraro, Will Handley, Chen Heinrich, Chang Feng, Colin Hill, Renee Hlozek, Gil Holder, Lloyd Knox, Kiyoshi Masui, Suvodeep Mukherjee, **Anirban Roy**, Emmanuel Schaan, Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 482 (2019)

#### AWARDS

Nov 2015-Oct 2019	PhD Fellowship in Astrophysics Division, SISSA, Italy
OCT 2015-NOV 2015	Postgraduate Fellowship in Astrophysics Division, SISSA, Italy
15TH MARCH 2015	1st Prize in Poster Presentation in Westbengal Science and Technology Congress, Burdwan, India

#### COLLABORATION

**CCAT-prime Observatory:** Intensity mapping working group

**Simons Observatory:** SZ and cluster group, Lensing working group

**CMB S4:** Galaxy formation and evolution group

**CMB Bharat (An India based space CMB mission):** Reionization and lensing working group

#### COMPUTER SKILLS

PROGRAMMING LANGUAGES	Python, C
DEVELOPED PACKAGES	LimPY (line insity mapping in python), and SecPY (python code for CMB secondary observables)
SCIENTIFIC PACKAGES	CLASS, Monte Python, CosmoMC, CAMB, HEALPY, emcee, Lenspix, Quicklens, LensIt, CMB4CAST, Cosmology, 21cmFAST, 21cmSense, Picola, Pylians
SIMULATION	Worked on <a href="#">Sherwood simulation suite</a> TNG-ilustris, and UniverseMachine
OS & OTHERS	Windows, Linux, Mac, LaTeX

#### STUDENTS SUPERVISED

Dariannette Valentin (Arizona State University): "Modeling CII & OIII line emission during the epoch of reionization"

#### CONFERENCE/WORKSHOP/SCHOOL/ VISIT

JUNE 2020	Simons observatory collaboration meeting, (online).
APRIL 2020	CCAT-p collaboration meeting, (online).
JANUARY 2020	Academic visit, New York University, Abu Dhabi.
JUNE 2019	"Quantum to Cosmos", Tubitak Tusside, Gebze, Turkey.
MARCH 2019	Scientific Collaboration, NASA Jet Propulsion Laboratory, Pasadena, USA.
JUNE 2018	CMB S4 Collaboration Meeting, Fermilab, Chicago, USA.
AUGUST 2018	Academic visit and CMB S4 collaboration meeting, Princeton University, Princeton, USA.
JUNE 2018	Simons Observatory Collaboration Meeting, University of Pennsylvania, Philadelphia, USA.
MARCH 2018	Academic Visit, Center for Computational Astrophysics, New York, USA.
OCT 2017	Post Planck Cosmology-Enigma, Challenges and Visions, IUCAA, Pune, India.
SEP 2017	Astro-Trieste conference, SISSA, Trieste, Italy.
JUL 2017	Probing the space-time fabric: from concepts to phenomenology, SISSA, Trieste, Italy.
JAN 2017	III Saha Theory Workshop: Aspects of Early Universe Cosmology, SINP, Kolkata, India.

DEC 2016 Academic Visit, Tata Institute of Fundamental Research, Mumbai, India.  
 JUN 2016 Summer School in Cosmology, ICTP, Trieste, Italy.  
 NOV 2014 "Observational Aspects of Astrophysics and Cosmology", Visva Bharati University, Shantiniketan, India.  
 AUG 2014 "Topical Conference on Gravity and Cosmology", Presidency University, Kolkata, India.  
 FEB 2013 "Workshop on Solar Physics, Vivekananda University, Belur, India.  
 DEC 2012 "Virtual Observatory In Astrophysics", University of Calcutta, Kolkata, India.

## TALKS

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INVITED "Cross-correlation studies as a probe of reionization",  
 CMB-S4 workshop, University of Chicago, USA (remote presentation)

CONTRIBUTED "Late-time universe: surprises, tension, and future prospects",  
 IISER Pune, pune, India

INVITED "Patchy Reionization and induced *B*-mode signal",  
 Conference Speaker, Tor Vergata, Rome, Italy, May 30, 2019

CONTRIBUTED "*B*-mode signal from patchy reionization",  
 Conference Speaker, ICTS, Bangalore, India, January 24, 2019

INVITED "Probing the new physics with future CMB experiments",  
 Seminar Speaker, Jamia Millia Islamia, New Delhi, India, December 20, 2018

CONTRIBUTED "Do we need to worry about patchy reionization?",  
 Fire slide, Simons Observatory Collaboration meeting, Upenn, USA, June 18, 2018

INVITED "Probing the reionization with Cosmic Microwave Background",  
 Seminar Speaker (Remote), IIT-Indore, Indore, India, May 14, 2018

INVITED "Precision Cosmology with the baby picture of the Universe",  
 Seminar speaker, Akdeniz University, Turkey, March 13, 2018

"INVITED "Precision Cosmology with the baby picture of the Universe",  
 Seminar speaker, Istanbul University, Turkey, March 12, 2018

"INVITED "Cosmic Reionization: What can future CMB experiments tell us?",  
 Seminar speaker, SINP, Kolkata, India, October 10, 2017

INVITED "Cosmic Reionization: What can future CMB experiments tell us?",  
 Seminar speaker, Challenges and Visions, IISER, Kolkata, India, October 13, 2017

CONTRIBUTED "Observing Patchy Reionization with Future CMB Polarization Experiments",  
 Post Planck Cosmology-Enigma, Challenges and Visions, IUCAA, Pune, India, October 10, 2017

CONTRIBUTED "Observing Patchy Reionization with CMB S4",  
 Astro-Trieste Conference, SISSA, Trieste, Italy, September 26, 2017

CONTRIBUTED "Effects of inhomogeneous reionization on CMB anisotropy",  
 III Saha Theory Workshop: Aspects of Early Universe Cosmology,  
 Saha Institute of Nuclear Physics, Kolkata, India, January 16, 2017

INVITED "Our Universe: Through The Eyes of A Cosmic Detective",  
 "Challenges in Modern Cosmology", Seminar Speaker,  
 University of Dhaka, Dhaka, Bangladesh, January 7, 2016,

## OTHER ACADEMIC INTERESTS

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I am very interested to work actively on Science popularization among school and undergraduate students as well as to the public, particularly, from the developing countries.

## LANGUAGES

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Bengali (Mother tongue), English (Fluent), Hindi (speaking)

## REFERENCES

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- NICHOLAS BATTAGLIA | *Assistant Professor, Astrophysics Division*  
Cornell University, USA  
E-mail: [nb572@cornell.edu](mailto:nb572@cornell.edu)  
Homepage: <https://astro.cornell.edu/nicholas-battaglia>
- DAVID SPERGEL | *Emeritus Professor, Princeton University, USA*  
Director, CCA, Flatiron Institute  
E-mail: [dns@astro.princeton.edu](mailto:dns@astro.princeton.edu)  
Homepage: <http://www.astro.princeton.edu/~dns>
- CARLO BACCIGALUPI | *Full Professor, Department of Astronomy*  
SISSA/ ISAS- International School for Advanced Studies, Italy  
E-mail: [bacci@sissa.it](mailto:bacci@sissa.it)  
Homepage: <http://www.people.sissa.it/~bacci>
- GIRISH KULKARNI | *Assistant Professor, Department of Physics*  
Tata Institute Of Fundamental Research (TIFR), India  
E-mail: [kulkarni@theory.tifr.res.in](mailto:kulkarni@theory.tifr.res.in)  
Homepage: <http://theory.tifr.res.in/~kulkarni/>
- ANTHONY CHALLINOR | *Professor, University of Cambridge, UK*  
Deputy Director, IoA and Kavli Institute for Cosmology, Cambridge  
E-mail: [A.D.Challinor@ast.cam.ac.uk](mailto:A.D.Challinor@ast.cam.ac.uk)  
Homepage: <http://www.damtp.cam.ac.uk/people/a.d.challinor>