

Anirban ROY

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PERSONAL DATA

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Citizenship: Indian
Date of Birth: March 17, 1993

PRESENT POSITION

1/10/2019 - PRESENT

Research Associate

Cornell Center for Astrophysics and Planetary Science
Cornell University, Ithaca, USA
Mentor: Nicholas Battaglia

EDUCATION

1/10/2015 - 30/09/2019

PhD cum laude 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
Award date: 19/09/2019

01/09/2013 - 30/07/2015

Master Degree in Physics (M.Sc.)

University of Burdwan, Burdwan, India
Master thesis: Secondary anisotropies in Cosmic Microwave Background
Supervisor: Sarbeswar Chaudhuri

01/08/2010 - 30/07/2013

Bachelor Degree in Physics (B.Sc.)

Asutosh College, Kolkata, India

WORK EXPERIENCE

01/05/2018 - 01/08/2018

Visiting Student

University of Cambridge, UK
Project Title: The study of reionization induced B -mode signal
Collaborators: Girish Kulkarni, Daan Meerburg, Anthony Challinor, and Martin Haehnelt

15/01/2014 - 01/05/2015

Project Student

Presidency University, India
Project Title: Modelling Sunyaev Zeldovich effect in active galaxies
Supervisor: Suchetana Chatterjee

RESEARCH INTEREST

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: multi-line intensity mapping, redshifted 21-cm signal, star formation history in high redshift galaxies.

RESEARCH PAPERS

In preparation

14) "Estimators for the analysis of multi-line intensity mapping"
Anirban Roy, Kailai Wang, et al.

13) "Prospects of multi-line intensity mapping by upcoming experiments"
Anirban Roy, Dariannette Valentin, et al.

Submitted

12) "Probing circumgalactic medium from the CMB polarization statistical anisotropy"
Anirban Roy, Vera Gluscevic, Alexander Van Engelen, and Nicholas Battaglia
submitted in APJ,
[\[arXiv:2201.05076\]](#)

11) "CCAT-prime Collaboration: Science Goals and Forecasts with Prime-Cam on the Fred Young Submillimeter Telescope"
Aravena et al. (including **Anirban Roy**), submitted in APJ
[\[arXiv:2008.12619\]](#)

Published

10) "Constraining reionization with the first measurement of the cross-correlation between the CMB optical-depth fluctuations and the Compton y -map"
Toshiya Namikawa, **Anirban Roy**, Blake Sherwin, Nicholas Battaglia, and David Spergel
[\[arXiv:2102.00975\]](#), PRD, (2021) 6, 104, 063514

9) "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**
[\[arXiv:2006.09742\]](#), MNRAS (2021), 501, 4, 6215

8) "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
[\[arXiv:2004.02927\]](#), JCAP (2021), 01, 003

7) "CMB-S4: Forecasting Constraints on Primordial Gravitational Waves"
Kevork Abazajian et al., including **Anirban Roy**
[\[arXiv:2008.12619\]](#), August, 2020, accepted for publication in APJ

6) "Detectability of the $\tau - 21\text{ cm}$ cross-correlation: a tomographic probe of patchy reionization"
Anirban Roy, Andrea Lapi, David Spergel, Carlo Baccigalupi
[\[arXiv:1904.02637\]](#), JCAP (2020), 3, 62

5) "Cosmology with low-redshift observations: No signal for new physics"
Koushik Dutta, **Anirban Roy**, Ruchika, Anjan A. Sen, M.M. Sheikh-Jabbari
[\[arXiv:1808.06623\]](#), PRD (2019), 100, 103501

4) "The Simons Observatory: Science goals and forecasts"
Peter Ade et al., (including **Anirban Roy**)
[\[arXiv:1808.07445\]](#), JCAP(2019), 56

3) "Beyond Λ CDM with Low and High Redshift Data: Implications for Dark Energy"
Koushik Dutta, **Anirban Roy**, Ruchika, Anjan A. Sen, M.M. Sheikh-Jabbari
[\[arXiv:1908.07267\]](#), GRG (2020), 52, 15

2) "CMB-S4 Science Case, Reference Design, and Project Plan",
Kevork Abazajian et al. (including **Anirban Roy**)
[\[arXiv:1907.04473\]](#) (2019)

1) "Observing Patchy Reionization With Future CMB Polarization Experiments",
Anirban Roy, Andrea Lapi, David Spergel, Carlo Baccigalupi
[\[arXiv:1801.02393\]](#), JCAP (2018), 5, 014

White paper/ Proceedings

3) "CMB-S4 Decadal Survey APC White Paper"

Kevoork Abazajian et al.

[arXiv:1908.01062], Bull.Am.Astron.Soc. 51 (2019) no.7, 209

2) "The Simons Observatory: Astro2020 Decadal Project Whitepaper"

Simons Observatory Collaboration

[arXiv:1907.08284], Bull.Am.Astron.Soc. 51 (2019) 147

1) "Unique Probes of Reionization with the CMB: From the First Stars to Fundamental Physics"

Alvarez et al. (including **Anirban Roy**)

Bulletin of the American Astronomical Society, Vol. 51, Issue 3, 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 West Bengal Science and Technology Congress , Burdwan, India

COLLABORATION

Fred Young Submillimeter Telescope (FYST): Intensity mapping working group

Simons Observatory: SZ and Cluster working group

CMB S4: Maps to other statistics working group

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

COMPUTER SKILLS

PROGRAMMING LANGUAGES Python (advanced), C (working knowledge), MATLAB, Fortran (basic knowledge)

DEVELOPED PACKAGES LIMPY (line intensity mapping in python), and SECpy (code for CMB secondary observables)

SCIENTIFIC PACKAGES CLASS, Monte Python, CosmoMC, CAMB, HEALPY, emcee, Lenspix, Quicklens, LensIt, CMB4CAST, Cosmology, 21cmFAST, 21cmSense, Picola, and Pylians

SIMULATION Worked on [Sherwood simulation suite](#), TNG-ilustris, and UniverseMachine

OS & OTHERS Windows, Linux, Mac, and LaTeX

STUDENTS SUPERVISED

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

Kailai Wang (Cornell University): "Development of analysis tools for line intensity mapping."

Ariel Baksh (Cornell University): "Noise simulations for line intensity mapping observations."

CONFERENCE/WORKSHOP/SCHOOL/ VISIT

APRIL 2022 CCAT-p collaboration meeting, (online).

APRIL 2021 CCAT-p collaboration meeting, (online).

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 Academic visit, 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 Workshop on "Virtual Observatory In Astrophysics", University of Calcutta, Kolkata, India.

TALKS

- INVITED "Probing reionization and CGM with tSZ and cross-correlations",
CCA, Flatiron Institute, USA, June 2, 2022
- INVITED "Electrons and baryons in the Universe: from first billion years to the present day",
remote presentation, IISER Kolkata, India, April 20, 2022
- CONTRIBUTED "Towards the optimal statistics for LIM estimators",
remote presentation, CCAT-prime collaboration meeting, April 5, 2022
- INVITED "Cosmology with the first light in the Universe: from first billion years to the present day",
Istanbul University (remote presentation), Turkey, February 28, 2022
- INVITED "Cross-correlation studies with future CMB experiments",
Tata Institute of Fundamental Research, India (remote presentation), May 21, 2021
- INVITED "Cross-correlation studies as a probe of reionization",
CMB-S4 workshop, University of Chicago, USA (remote presentation), August 11, 2021
- CONTRIBUTED "Late-time universe: surprises, tension, and prospects",
IISER Pune, India, January 7, 2020
- INVITED "Patchy Reionization and induced B -mode signal",
Conference Speaker, Tor Vergata, Rome, Italy, August 12, 2020
- 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,

OUTREACH ACTIVITIES

I am actively working on Science popularization among school students and the public, particularly from developing countries. I delivered more than ten talks in school and colleges. In addition to that, I organized "Women in Science" events in India to encourage female students from rural areas of India to pursue a career in science.

LANGUAGES

Bengali (native), English (fluent), Hindi (speaking)

REFERENCES

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| Nicholas Battaglia | <i>Assistant Professor, Astrophysics Division</i>
Cornell University, USA
E-mail: nb572@cornell.edu
Homepage: https://astro.cornell.edu/nicholas-battaglia |
| David Spergel | <i>Emeritus Professor, Princeton University, USA</i>
President, Simons Foundation
E-mail: dns@astro.princeton.edu
Homepage: http://www.astro.princeton.edu/~dns |
| Carlo Baccigalupi | <i>Full Professor, Department of Astronomy</i>
SISSA/ ISAS- International School for Advanced Studies, Italy
E-mail: bacci@sissa.it
Homepage: http://www.people.sissa.it/~bacci |
| Andrea Lapi | <i>Full Professor, Department of Astronomy</i>
SISSA/ ISAS- International School for Advanced Studies, Italy
E-mail: lapi@sissa.it
Homepage: https://lapi.jimdofree.com/ |
| Girish Kulkarni | <i>Assistant Professor, Department of Physics</i>
Tata Institute Of Fundamental Research (TIFR), India
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