

# Aklant Kumar Bhowmick

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## EDUCATION

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**Doctor of Philosophy (Ph. D) in Physics** 2014-2019  
*Carnegie Mellon University*  
“Clustering of quasars and high redshift galaxies: New frontiers for structure formation”  
Thesis advisor: Prof. Tiziana Di Matteo

**Integrated Masters in Physics** 2009-2014  
*University of Mumbai, Center for Excellence in Basic Sciences*  
”Determination of Higgs Boson properties through rare processes at the Large Hadron Collider”  
Thesis advisor: Prof. Sreerup Raychauduri, Tata Institute of Fundamental Research, India

## RESEARCH INTERESTS

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Cosmological hydrodynamic simulations of galaxy formation and black hole growth; Origin of super-massive blackholes; Galaxy and quasar clustering; Galaxy-halo connection;

## CURRENT POSITION

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**Post doctoral research associate** 2019-ongoing  
*Supervisor: Dr. Laura Blecha*

- Develop code to implement realistic black hole seeding prescription for the next generation cosmological simulations with a team of graduate and undergraduate researchers.
- Probe the connection between active galactic nuclei (AGN) and galaxy mergers in cosmological simulations.

## PUBLICATIONS IN GALAXY FORMATION

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1. **Aklant K. Bhowmick**, Laura Blecha, Paul Torrey, Luke Zoltan Kelley, Mark Vogelsberger, Kaitlyn Kosciw, Dylan Nelson, Rainer Weinberger, Lars Hernquist, “[Impact of gas based seeding on supermassive black hole populations at  \$z \geq 7\$](#) ”, *The Astrophysical Journal* **904** 2 (2020).
2. **Aklant K. Bhowmick**, Laura Blecha, July Thomas, “[Supermassive Blackhole Fueling in Illustris TNG: Impact of environment](#)”, *The Astrophysical Journal* **904** 2 (2020).

3. Xuheng Ding, Tommaso Treu, John D. Silverman, **Aklant K. Bhowmick**, N. Menci, and Tiziana Di Matteo, “[Testing the Fidelity of Simulations of Black Hole–Galaxy Coevolution at  \$z \sim 1.5\$  with Observations](#)”, *Astrophysical Journal* **10.3847** 1538-4357 (2020).
4. **Aklant K. Bhowmick**, Rachel Somerville, Tiziana DiMatteo, Stephen Wilkins, Yu Feng, Ananth Tenneti, “[Cosmic Variance of  \$z > 7\$  galaxies: Predictions from BlueTides](#)”, *MNRAS* **496** 754-766 (2020).
5. **Aklant K. Bhowmick**, Tiziana DiMatteo, Adam D. Myers, “[Multiplicity Functions of quasars: Predictions from the MassiveBlackII simulation](#)”, *MNRAS* **492** 5620-5633 (2020).
6. **Aklant K. Bhowmick**, Yingzhang Chen, Ananth Tenneti, Tiziana Di Matteo, Rachel Mandelbaum, “[Evolution of Intrinsic Alignments in the MassiveBlackII universe](#)”, *MNRAS* **491** 4116-4130 (2020).
7. **Aklant K. Bhowmick**, Tiziana DiMatteo, Sarah Eftekarzadeh, Adam D. Myers, “[On the small scale clustering of quasars: Constraints from the MassiveBlackII simulation](#)”, *MNRAS* **485** 202 (2019).
8. **Aklant K. Bhowmick**, Duncan Campbell, Tiziana DiMatteo, Yu Feng, “[Halo occupation distribution modeling of high redshift galaxies using the BlueTides simulation](#)”, *MNRAS* **480** 3-11 (2018).
9. **Aklant K. Bhowmick**, Tiziana DiMatteo, Yu Feng, Francois Lanusse, “[Clustering of  \$z > 7\$  galaxies: Predictions from the BlueTides simulation](#)”, *MNRAS* **474** 4-11 (2018).
10. Kuan-Wei Huang, Tiziana DiMatteo, **Aklant K. Bhowmick**, Yu Feng, Chung-Pei Ma, “[BlueTides simulation: establishing black hole–galaxy relations at high redshift](#)”, *MNRAS* **478** 5063-5073 (2018).

## **PUBLICATIONS IN PLASMA PHYSICS**

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1. Desmond L. Hill, **Aklant K. Bhowmick**, Dan V. Ilyin and Snezhana I. Abarzhi, “[Group theory analysis of early-time scale-dependent dynamics of the Rayleigh-Taylor instability with time varying acceleration](#)”, *Physical Review Fluids* **4** 063905 (2019).
2. Snezhana I. Abarzhi, **Aklant K. Bhowmick**, Annie Naveh, Arun Pandian, Nora C. Swisher, Robert F. Stellingwerf and W. David Arnett, “[Supernova, nucleosynthesis, fluid instabilities and interfacial mixing](#)”, *PNAS* **10** 1073 (2018).
3. Z. R. Dell, A. Pandian, **A. K. Bhowmick**, N. C. Swisher, M. Stanic, R. F. Stellingwerf, and S. I. Abarzhi, “[Maximum initial growth-rate of strong-shock-driven Richtmyer-Meshkov instability](#)”, *Physics of Plasmas* **24** 090702 (2017).
4. **A.K. Bhowmick**, S.I Abarzhi, “[Richtmyer-Meshkov unstable dynamics influenced by pressure fluctuations](#)”, *Physics of Plasmas* **3** 11 (2016).
5. Gangadhara, R. T., Krishan, V., **Bhowmick, A. K.**, Chitre, S. M., “[Generation of Magnetic Structures on the Solar Photosphere](#)”, *The Astrophysical Journal* **788** 2 (2014).

## CONFERENCE TALKS

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1. “Cosmological simulations of galaxy formation: Fluid mechanics at the largest scales”, Invited talk, *S.M. Chitre Memorial Symposium on Frontiers of Astrophysics and Fluid Mechanics*, 2021
2. “Supermassive Blackhole fueling in Illustris-TNG: Impact of environment”, Contributed talk, *AAS meeting*, 2021
3. “Supermassive Blackhole fueling in Illustris-TNG: Impact of environment”, Invited Colloquium, *Harvard-Smithsonian Center for Astrophysics*, 2020
4. “Supermassive Blackhole fueling in Illustris-TNG: Impact of environment”, Pre-recorded talk, *13th LISA symposium*, 2020
5. “Probing the merger-AGN connection in cosmological hydrodynamic simulations”, Invited talk, *Getting ready to descend into the slippery slope of multi-messenger cosmological black holes data*, Sexten Center for Astrophysics, Sexten, Italy, 2020
6. “Clustering of quasars and high redshift galaxies: New frontiers for structure formation”, Invited seminar talk, University of Florida, 2019
7. “Clustering and dark matter haloes of galaxies at  $z > 7$ : Predictions from BlueTides”, Early Universe 2019, UCLA
8. “BlueTides: Simulating the next frontier of galaxies and AGNs”, Workshop on WFIRST/LSST Deep Fields, 2018
9. “Clustering of  $z > 7$  galaxies: Predictions from the BLUETIDES simulation”, Cosmology on the Beach 2017
10. “Effect of pressure field fluctuations on the nonlinear evolution of Richtmyer-Meshkov coherent structure”, APS-DPP and DFD 2015
11. “Highly symmetric interfacial coherent structures in Rayleigh Taylor instability with time-dependent acceleration”, APS-DFD 2016
12. “Dimensional crossover in Richtmyer-Meshkov flows”, APS-DFD 2016
13. “Low-symmetric coherent structures and dimensional crossover in Rayleigh Taylor flows driven by time dependent accelerations”, APS-DFD 2016

## TECHNICAL SKILLS

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1. Building analysis tools for data from a wide range of cosmological simulations.
2. Building empirical models to capture complex trends exhibited by data from cosmological simulations. For e.g., in publication 6, 7 and 8, I built analytic halo occupation distribution (HOD) models to capture the behavior of galaxies in cosmological simulations.
3. Development and execution of widely used cosmological softwares such as [AREPO](#), [ROCKSTAR](#), [SUBLINK](#), [Halotools](#), [astropy](#), [yt-project](#)

4. Programming Languages: Python; C++; Mathematica; Fortran 90
5. Parallel programming: MPI, openMP, python multiprocessing

## AWARDS

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1. [Presidential Fellowship](#) (2016-2017): I was awarded this fellowship to conduct my thesis research based on my research output during 2014-2016,.
2. [Inspire Scholarship](#) (2009-2014): Selected as 1 of 30 students for full scholarship for undergraduate education based on a nationwide entrance examination ([NEST](#)).

## COMMUNITY SERVICE

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1. Referee for MNRAS and ApJ.
2. As part of a mentorship programme, I provide guidance to current graduate students on navigating opportunities and challenges in graduate education.

## TEACHING EXPERIENCE

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1. **Physics II for Engineering and Physics Students** (6 semesters between 2014-2017) with Prof. George Klein:
  - Designed and conducted weekly recitations for undergraduate students, focusing on Electricity and Magnetism.
  - Graded exams, homeworks, and provided additional office hours support for students.
2. **Summer Academy of Math and Sciences (SAMS), Astronomy for high school students** with Prof. Diane Turnshek.
  - Led lectures for high-achieving high school aged students on dark matter, dark energy, black holes and stellar evolution.
  - Conducted lab experiments such as: 1) Testing efficiencies of various light bulbs. 2) Spectroscopy 3) Determining time period of pendulum oscillations
  - Organized field trips to nearby observatories.
  - Supervised a final group project to assess the growth of light pollution in the city of Pittsburgh over the last two decades.