

# DEOVRAT PRASAD

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## RESEARCH INTERESTS

Feedback Processes in Galaxies, Groups and Clusters  
Galaxy Formation and Evolution  
Accretion onto Super Massive Black Holes  
Numerical Methods

## EMPLOYMENT

Postdoctoral Fellow, November 2022 to present, Cardiff University, Cardiff, UK

Postdoctoral Fellow, July 2018 - June 2022, Michigan State University, East Lansing, US

## EDUCATION

### PhD, Astronomy and Astrophysics, CSIR Junior/Senior Research Fellow

June 2018, Indian Institute of Science, Bangalore, India

Thesis:- AGN Feedback In Galaxy Clusters - Controlling cooling flows in galaxy clusters  
by momentum-driven AGN jets

Advisor :- Prateek Sharma

### Integrated M.Sc. (5 year program), Physics, INSPIRE Fellow

2012, University of Mumbai, Mumbai, India

## FELLOWSHIPS

INSPIRE fellowship, 2007-12, Dept. Of Science and Technology, Govt. Of India.

CSIR-UGC NET fellowship, 2012-2017, 24th All India Rank in National Eligibility Test (June-2012)

## COMPUTING GRANTS

NSF XSEDE (Comet) : Precipitation-Regulated AGN Feedback in Halos From  $10^{12} - 10^{15} M_{\odot}$   
( PI, 1.23 million CPU hours ) July 2019 - June 2020.

NSF XSEDE (Comet & Expanse) : Precipitation-Regulated AGN Feedback in Halos From  
 $10^{12} - 10^{15} M_{\odot}$  ( PI, 2.05 million CPU hours ) Jan 2021 - June 2022.

NSF XSEDE (Stampede & Expanse) : Probing Galaxy Formation at Low and High Redshifts  
( Co-PI, 1.6 million CPU hours ) Jan 2022 - Dec 2022.

INCITE (Frontier - Oak Ridge Leadership Computing Facility) : Feedback and Energetics from Magnetized AGN  
Jets in Galaxy Groups and Clusters (Co-PI, 630 K + 600 K GPU node hours) Jan 2023 - Dec 2024

## REVIEW EXPERIENCE

2022, subject matter expert reviewer in a NASA peer review.

2018, subject matter expert reviewer for a paper in MNRAS journal

## **TEACHING EXPERIENCE**

Guest Lecturer, Energy and Gas in Interstellar Space, Graduate Course, Cardiff University, Instructor Dr. Tim Davis (January- May 2024)

Co-Instructor, Introduction to Astrophysics, Undergraduate course, Cardiff University, Co-teaching with Dr. Mathew Smith (January-May 2024)

Co-Instructor, Introduction to Astrophysics, Undergraduate course, Cardiff University, Co-teaching with Dr. Mathew Smith (January-May 2023)

Teaching Assistant, Electricity, Magnetism and Optics, Undergraduate course, IISc, taught by Dr. Tarun Deep Saini. (January - April, 2015)

Teaching Assistant, Fluids and Plasma, Graduate course, IISc, taught by Prof. Prateek Sharma. (August - November, 2014)

## **MENTORING EXPERIENCE**

Co-Mentoring one Masters student through annual project, School of Physics and Astronomy, Cardiff University (September 2024 onwards)

Mentored one student through ‘ACRES 2019’ summer program, CMSE Dept., Michigan State University (May-July 2019)

## **MAJOR COLLABORATIONS**

Feedback and Energetics from Magnetized AGN Jets collaboration at Michigan State University, US.

Formerly part of Figuring Out Gas & Galaxies in Enzo (FOGGIE) collaborations at Space Telescope Science Institute, US.

## **PROGRAMMING EXPERIENCE**

Fortran77/95, C, C++, Python, Matlab, MPI

Research experience with Zeus-MP, Pluto, Enzo, AthenaPK and Arepo HD/MHD codes.

Experience of working on XSEDE, NASA, MSU, IISc and SCW high performance computing facilities.

Co-developer of Enzo code - mainly with implementing AGN feedback using “Active Particle” formulation.

Co-developer of PLUTO code - mainly with developing AGN feedback and Runge-Kutta-Legendre super-time-stepping method for implementing anisotropic thermal conduction.

## **PRESENTATIONS**

### **Important conference presentations**

Environmental effects on Black Hole Feedback Valve in Massive Galaxies, Resolving Galaxy Ecosystems Across All Scales, The Chinese University of Hong Kong, Hong Kong, December 2023. **(TALK)**

Environmental effects on Black Hole Feedback Valve in Massive Galaxies, 6th ICM Theory and Computation Workshop, Neils Bohr Institute, Copenhagen, Denmark, August 2022. **(TALK)**

AGN and Stellar Feedback in Galaxy Clusters, ASTRONUM-2019, Paris, France, July 2019 **(TALK)**

Role of BCG and AGN-driven Turbulence in Galaxy Cluster Evolution, SnowCluster - The Physics of Galaxy Clusters, Snowbird, Utah, US, March 2018 (**TALK**)

AGN Feedback in Galaxy Groups, The Physics of Groups and Galaxy Properties therein meeting, Institut d'Astrophysique de Paris (IAP) Paris, France, December 2016 (**TALK**)

### **Other important presentations**

Environmental effects on Black Hole Feedback Valve in Massive Galaxies, Department of Physics, Indian Institute of Science, Bangalore, October 2022 (**COLLOQUIUM**)

Cool Core Cycles - AGN Feedback in Galaxy Groups and Clusters, Inter-University Centre for Astronomy and Astrophysics, Pune, September 2022 (**COLLOQUIUM**)

Cool Core Cycles - AGN Feedback in Galaxy Groups and Clusters, Department of Astronomy and Astrophysics, Tata Institute of Fundamental Research, Mumbai, September 2022 (**COLLOQUIUM**)

Environmental dependence of self-regulating black hole feedback in massive galaxies, HALO 2021, KITP, US, January-March 2021 (**SHORT VIDEO**)

Environmental effects on Black Hole Feedback Valve in Massive Galaxies, Astro Group Meeting, Centre for Computational Astrophysics, Faltiron Institute, October 2020 (**TALK**)

The Feedback Loop : Controlling cooling flows in galaxy clusters, Physics and Astronomy, Astronomy Colloquium, University of Notre-Dame, US, December 2018 (**COLLOQUIUM**)

## **PUBLICATIONS**

### **Lead Author Publications**

*The Case for Hot-Mode Accretion in Abell 2029*

Deovrat Prasad, Mark Voit and Brian O'Shea, 2024, MNRAS, 531, 259

*Atmospheric Circulation in Simulations of the AGN-CGM Connection at Halo Masses  $\sim 10^{13.5} M_{\odot}$*

Deovrat Prasad, Mark Voit and Brian O'Shea, 2022, ApJ, 932, 18

*Environmental Dependence of Self-Regulating Black-hole Feedback in Massive Galaxies*

Deovrat Prasad, Mark Voit, Brian O'Shea, and Forrest Glines, 2020, ApJ, 905, 50

*Cool-Core Cycles and Phoenix*

Deovrat Prasad, Prateek Sharma, Arif Babul, Mark Voit and Brian O'Shea, 2020, MNRAS, 495, 594

*Cool-Core Clusters : Role of BCG, Star Formation & AGN-Driven Turbulence*

Deovrat Prasad, Prateek Sharma, and Arif Babul 2018, ApJ, 863, 62

*AGN jets driven stochastic cold accretion in cluster cores*

Deovrat Prasad, Prateek Sharma, and Arif Babul, 2017, MNRAS, 471, 1531

*Cool core cycles: Cold gas and AGN jet feedback in cluster cores*

Deovrat Prasad, Prateek Sharma, and Arif Babul, 2015, ApJ, 811, 108

### **Other Publications**

*A Black-Hole Feedback Valve in Massive Galaxies*

Voit, G. M. *et al.* (including **Prasad, D.** ) 2020, ApJ, 899, 70

*Figuring Out Gas & Galaxies In Enzo (FOGGIE). IV. The Stochasticity of Ram Pressure Stripping in Galactic Halos*

Simons, R. C. *et al.* ( including **Prasad, D.** ) 2020, ApJ, 905, 167

*Scalable explicit implementation of anisotropic diffusion with Runge-Kutta-Legendre super-time-stepping*

Vaidya, B., **Prasad, D.** *et al.* 2017, MNRAS , 472, 3147

### **To be Submitted**

*Importance of magnetic fields in the AGN feedback in massive galaxies?*

Deovrat Prasad, Philipp Grete, Forrest Glines, Brian O'Shea and Ben Wibking (Under preparation)

### **REFERENCES**

#### **Mark Voit**

Professor  
Physics and Astronomy  
3276 Biomed and Phy Sciences  
Michigan State University  
East Lansing, MI 48824 US  
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#### **Prateek Sharma**

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#### **Freeke van de Voort**

Lecturer and Royal Society Research Fellow  
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#### **Brian O'Shea**

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