



CELEBRATING 10 YEARS OF ASHOKA. Watch the film here.





Enquiry A REPOSITORY OF ASHOKA'S RESEARCH



Enquiry



VOLUME 2

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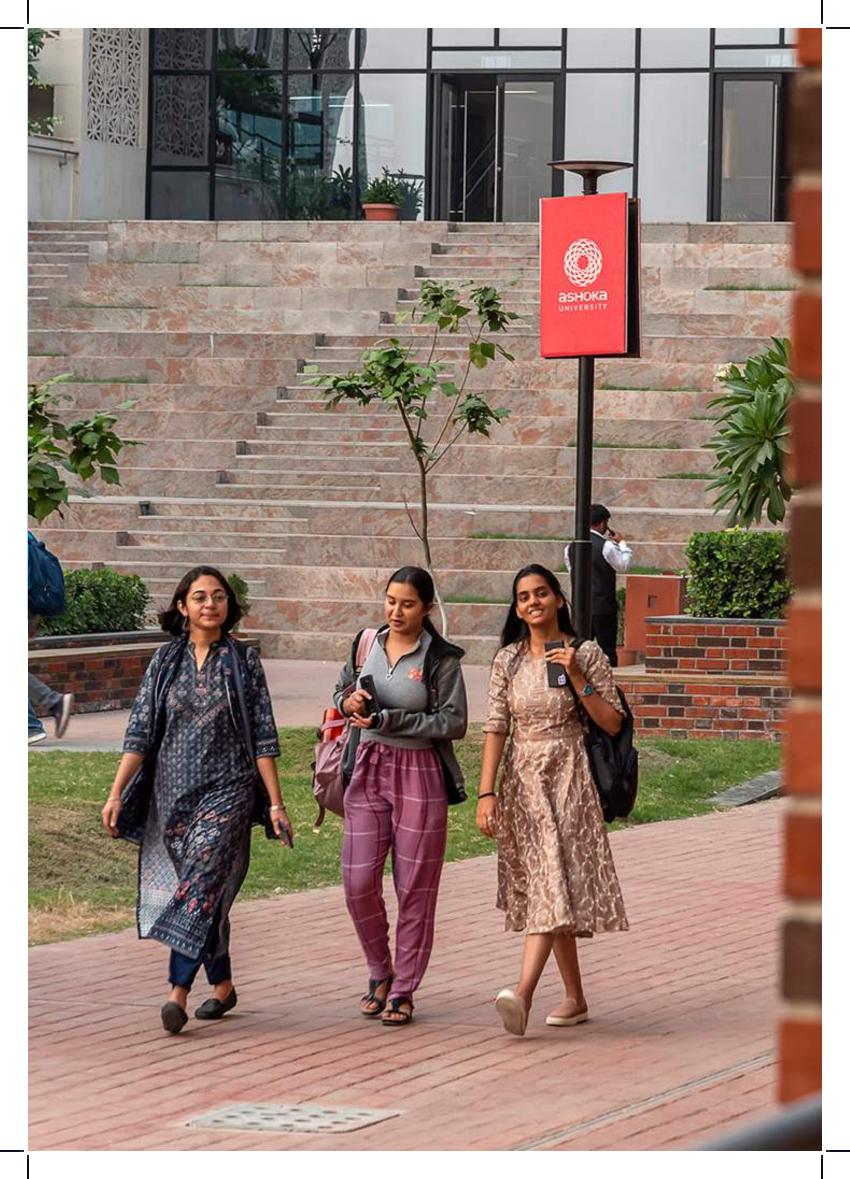
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VICE CHANCELLOR

We remain committed to becoming knowledge creators, through original and path-breaking research.

The first ten years of Ashoka have been marked by significant growth and I'm incredibly proud of what we've achieved so far. Ashoka has, today, cemented its position as the finest interdisciplinary university in the country. We remain committed to becoming knowledge creators, through original and path-breaking research.

This past year has been particularly notable with several landmark accomplishments. Volume 2 of Enquiry talks about all of this and much more. One of the highlights was hosting NASA's South Asian Regional Initiative meeting for the very first time. This is a development that places Ashoka on the global research map. I am also delighted that Ashoka now has more than 200 PhD scholars working across 11 disciplines. In the last two years, we have graduated our first PhD students, Raghavi Garg (Economics) and Basabi Bagchi (Biology).

Ashoka launched five new Centres of Excellence in the academic year 2023-24, each of them working on

distinctive and relevant fields of study. Our faculty have continued to drive our research efforts. They have achieved a notable increase in output and earned prestigious accolades for their work.

The road ahead is brimming with opportunities. As we step into the next decade of Ashoka's growth, we will continue to push the boundaries of knowledge and research. We are eager to carry forward the spirit of curiosity, excellence and collaboration that has defined the University's first decade.

Somar Raychandhuy

SOMAK RAYCHAUDHARY

1. OVERVIEW

Ashoka has pioneered an education model

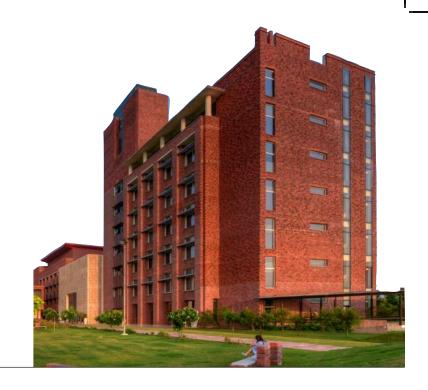
that weaves together teaching and research under one roof. The University has emerged as a hub for cutting-edge research across a range of disciplines.







The Year in Review Key research milestones and highlights





Economics professor and undergraduate alum win the 2023 Kuznets Prize

Anisha Sharma (Assistant Professor, Economics) and Garima Rastogi (ASP 2020)*, a former student who is currently pursuing an MPhil at the University of Oxford, were awarded the 2023 Kuznets Prize.

Named after Nobel laureate Simon Kuznets, the Prize is awarded for the best paper published in the *Journal of Population Economics*, every year. Anisha and Garima's paper is titled 'Unwanted Daughters: the unintended consequences of a ban on sex-selective abortions on the educational attainment of women'.

Undergraduate alum becomes the first Indian to win the McCall MacBain Global Scholarship

Mohit Kumar (ASP 2023) made history as the first Indian to win the prestigious McCall MacBain Global Scholarship. A first-generation learner from Firozabad, Uttar Pradesh, Mohit studied History, International Relations and Persian at Ashoka. He was one of the 10 global recipients of this scholarship from McGill University in 2023.

In 2024, Kiran Sahani (ASP 2023) became the second student from Ashoka to be awarded the McCall MacBain Scholarship. Kiran completed her bachelor's degree in Biology from Ashoka.

MOHITKUMAR

^{*} ASP: Ashoka Scholars Programme (4th undergraduate year)



History faculty appointed as editor of the History of Science Society's academic journal

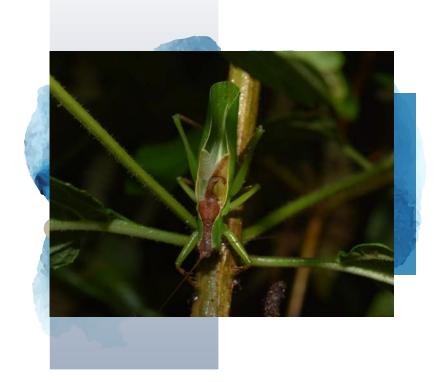
The History of Science Society selected Projit Bihari Mukharji (Head of Department and Professor of History) and Elise Burton (University of Toronto) to serve as the next editors of the Society's main academic journal, *Isis*.

Started in 1913, the History of Science Society is the foremost professional association for the academic study of the History of Science. Projit's appointment as editor marks a historic shift – making it the first time in the 114-year history of the journal that the editorial office will be situated in a university outside Europe and America.

Ashoka's first PhD scholar graduates

In 2023, as Raghvi Garg became Ashoka's first PhD scholar to receive her degree. Raghvi has conducted groundbreaking research in the field of Economics, focusing on decision-making and its societal implications. Her work explores the influence of norms on individual behaviour, with a keen interest in topics such as discrimination, gender, polarisation and conflict.

Basabi Bagchi, from the Department of Biology graduated in 2024 - becoming Ashoka's first Science PhD scholar to earn her degree.



Researchers discover new cricket species on campus

A group of researchers from Ashoka University have found three new species of crickets in the genus of *Hexacentrus* with distinct calls. Two of the species were found within the grounds of the University, and were named *Hexacentrus ashoka*. Numerous species of this particular genus of cricket exist around the world, but only seven had been previously found in India. This discovery has now taken the number to 10.

The discovery of the three species started in the Khasi Hills in Meghalaya, when Aarini Ghosh (PhD scholar, Department of Biology), the lead author of the study, identified sounds from two different species of crickets. Other researchers involved in the study include scholars from Panjab University, the University of Florida, as well as Vivek Dasoju (PhD Scholar, Department of Psychology), Anubhab Bhattacharjee (ASP 2023) and Bittu K Rajaraman (Associate Professor, Biology and Psychology) from Ashoka.

Ashoka announces the launch of five new Centres of Excellence

At the start of the academic year 2023-24, Ashoka announced the launch of several new Centres of Excellence. Centres at Ashoka undertake path-breaking work across domains and themes, engaging in research and creating social impact within and outside the Ashoka ecosystem.

The new centres include the Isaac Centre for Public Policy, Koita Centre for Digital Health at Ashoka, Centre for a People-centric Energy Transition, Centre for Data, Learning and Decision Sciences and Centre for Digitalisation, Al and Society.

Founding batch alum files and publishes Ashoka's first patent

Gurasheesh Paul Singh Law (UG 2017) has filed the University's first complete patent, which was published in 2023. Titled 'Respiratory Protection System and Method for Operation', his invention introduces a device designed to provide affordable access to high-quality respiratory protection in healthcare and industries.

The device is a wearable piece. It also incorporates a communication component that amplifies the user's voice in real-time and enables communication with distant users, thereby enhancing safety and communication in challenging environments.

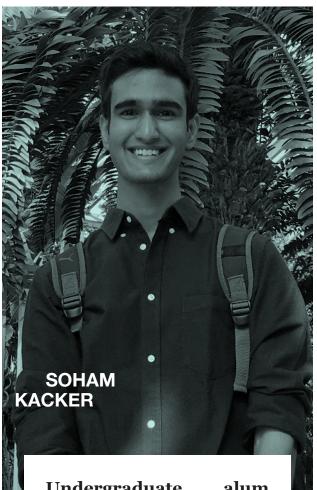




Alum creates history, plays key role in India's first solar mission

Aafaque R Khan (YIF 2014) was one of the lead engineers in the Solar Ultraviolet Imaging Telescope (SUIT) project aboard Aditya L-1 – India's first solar mission designed and developed by ISRO. He played a key role in building one of the major instruments, the telescope, onboard the observatory that will study the Sun's atmosphere.

From 2015 to 2019, Aafaque was involved in the end-to-end design and development of SUIT with various teams at ISRO and Pune's Inter-University Centre for Astronomy and Astrophysics (IUCAA). He is currently a graduate student and Future Investigator on the NASA-FINESST Grant at the University of Arizona.



Undergraduate alum publishes a photographic field guide to the flora of Mukteshwar Valley

Soham Kacker's (ASP 2023) undergraduate thesis focused on factors influencing tree and shrub regeneration in mid-Himalayan oak forests. While conducting fieldwork in Mukteshwar, Uttarakhand, he developed a profound interest in Himalayan flora. This ultimately led him to curate a field guide on the region's flora.

A Photographic Field Guide to Trees and Shrubs of Mukteshwar was published in January, 2024. This first-of-its-kind field guide will prove to be a handy tool for nature lovers. It also contributes to literature on forest research and restoration efforts. Soham is currently a master's student at the University of Oxford.

Ashoka team wins Innovation Award at the Global AMR Data Challenge

A team from Ashoka consisting of Shraddha Karve (Faculty Fellow, Trivedi School of Biosciences), Rintu Kutum (Faculty Fellow, Computer Science), Vasundhara Karthikeyan (Research Assistant) and Ragul N (ASP 2023) won the 'Innovation Award' at the Global AMR (Antimicrobial resistance) Data Challenge. It was organised by the global charitable foundation, Wellcome, and saw participants from 28 countries.

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Ashoka is establishing itself as a hub for cutting edge research and the creation of knowledge.

While traditional AMR surveillance and studies focus on specific drug-bug combinations, the team's research underlines the need for a more holistic approach – for the entire resistance profile of a bug to be taken into account, for effective surveillance, diagnosis and treatment.

Undergraduate student wins 'Best Research Paper' award at the South Asian Economics Students Meet 2024

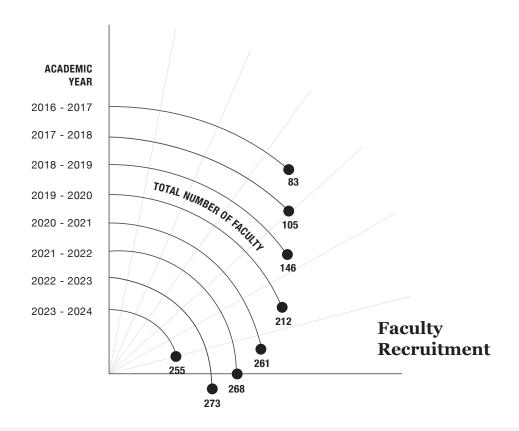
Raunaq Bawa (UG 2024) was awarded the 'Sen-Haq Award for the Best Research Paper' for his paper titled 'Curbing

Crop Stubble Burning in India: A Strategic Policy Interaction' at the South Asian Economics Students Meet (SAESM), held in Colombo.

Currently in its year, SAESM is a wellestablished undergraduate Economics student's annual meet in South Asia. This event provides an opportunity for students to develop academic papers on various issues of regional importance and present them, thereby honing their understanding of the South Asian region.



THE YEAR IN NUMBERS

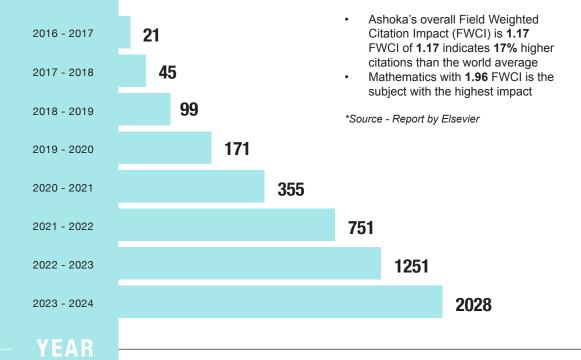


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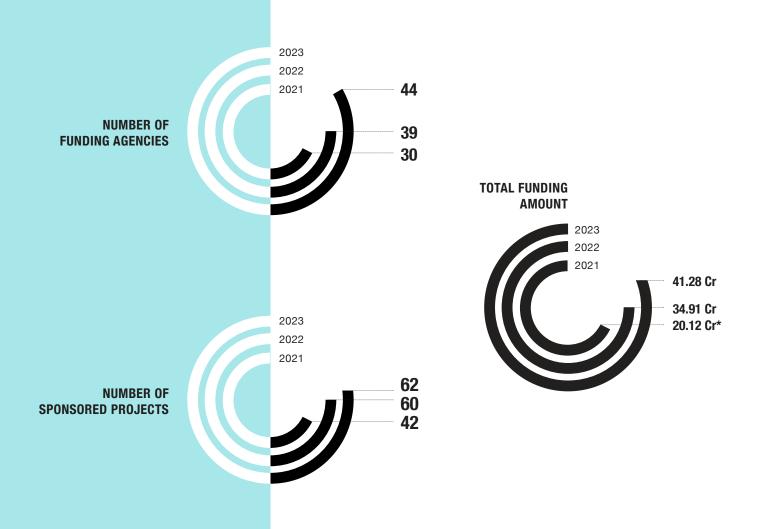
YEAR	2017	2018	2019	2020	2021	2022	2023	2024
FULL-TIME FACULTY	47	69	92	115	125	152	156	169
VISITING FACULTY	36	36	54	97	136	116	117	86

Publications 845 759 **TOTAL NUMBER OF** In the academic year **PUBLICATIONS** 509 2023-24, Biology led with 21 per cent of total 340 publications, followed by 209 **Economics and Chemistry** 122 47 per cent of the 2020 - 21 publications have **70** international collaborations 19 37 per cent of publications have single authorship *Source: Scopus and YEAR Web of Science

Citations



Funded Research



FACULTY SPEAKS

0

Ashoka is home to some of the finest intellectual minds

in the country and the world. Each of them have contributed to relevant and high-quality research in their respective fields.



SLEEPING and DREAMING the same NIGHTMARE: navigating UNCERTAINTY through the COVID-19 PANDEMIC



The COVID-19 pandemic affected the lives of millions of people. As we

know, there were two major waves of the disease, and each had its own sense of uncertainty. The first phase was marked by uncertainty about the nature of the disease itself and the lockdown. As multiple waves of the disease came and went by, daily living became further unpredictable with financial instability and a growing infodemic. Yet, very little is known about what this 'uncertainty' entailed, psychologically.

There has been limited research on uncertainty during the pandemic, specifically exploring the crisis as a collective experience that shaped

individual decision making. In psychological terms, Embodied Uncertainty (EU) refers to the subjective experience of uncertainty which is felt by individuals living in risk. It encompasses how individuals

and groups understand and interpret living through natural or man-made disasters.

My study attempts to bridge this gap, by examining people's experiences of the pandemic, across the two waves, from the lens of EU. We combined conventional psychological theories that explain how people deal with uncertainty, with extensive sociological studies — that focus on how cultural factors, government responses and technology play a part

in managing crises. We collected and analysed data shortly after the first wave of COVID-19, and then a year later, after the second wave. The study design aimed to capture differences in the lived experiences of the pandemic

based on social identity – we interviewed a diverse sample of participants, including small business owners, domestic workers and individuals from urban, affluent backgrounds, amongst others.

EU talks about four themes that encapsulate the experiences of any individual facing uncertainty – social

identity and trauma, co-production of knowledge, social and institutional structures and policy, and long-term lived experience of uncertainty. Thematic analysis revealed that immediate anxieties, especially in the first wave, were related to job uncertainty, rising prices, accessing necessities and a drop in economic productivity. These were more prominent than fears of the disease itself.

For participants in urban areas who came from advantaged socio-economic backgrounds, the nature of uncertainty had shifted by the second wave – they were getting used to the pandemic. For the rest though, pandemic-related uncertainties had only

The research paper based on this study - 'Embodied Uncertainty through the Covid-19 Pandemic: A Longitudinal Mixed Method Study' won the MB Sharan Best Paper Award at the 33rd Annual Convention of the National Academy of Psychology.

exacerbated, highlighting the significance of social identity in this experience. Interestingly, the study also revealed that contrary to official predictions, disease related stigma had reduced by the second wave. This was a direct outcome of the lived experience of a shared crisis.

Perceptions of governmental responsibility also shifted where anger and confusion gradually transformed into a disappointment with evidence of poor planning, ambiguous messaging and unhelpful resource allocation by the government. However,

the study also revealed active coping among many and a sense of optimism for life after the pandemic. Findings such as these can help contribute to the development of a preparedness framework based on community stories which recognise the strengths of lived experiences to alleviate future concern.

—SRAMANA MAJUMDAR

Sramana Majumdar is Assistant Professor of Psychology at Ashoka. Her primary areas of interest are identity, violence and intergroup relations. Presently, she is working on intergroup contact, prejudice and identity performance in computer-mediated communication. Sramana was a Fulbright-Nehru Scholar at Clark University and has worked on developing intervention-based insights on gender, health and COVID-19 pandemic.

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ith Ashoka stepping into its second decade, the last few years have seen a significant push towards increasing research capabilities across disciplines, and an effort to expand the Sciences at Ashoka.

We caught up with Dipankar Bhattacharya (Sunanda and Santimay Basu Chair for Astrophysics and Head of Department, Physics) and Projit Mukharji (Head of Department and Professor of History) to discuss how their respective departments are poised for growth and collaboration in the arena of research.

Q. Both of you have joined Ashoka at a crucial juncture, with the University pivoting to both the Sciences and research - how do you see your Department evolving to address these threads?

PROJIT: The Department of History at Ashoka is, today, widely recognised as one of the foremost departments in the country. Research has been a part of our profile even before the Universitywide pivot happened. The new direction the University has embarked on will allow us to further amplify our existing emphasis on research.

The introduction and expansion of the Sciences is also similarly something that is allowing us to build on existing strengths. My colleagues, Nayanjot Lahiri and Kalyan Sekhar Chakraborty, for instance, have developed a close working relationship with the Department of Biology (through their work at the Centre for Interdisciplinary

Archaeological Research). Mahesh Rangarajan has similarly developed close ties with environmental scientists. My own work, in the History of Science,

actually resonates with multiple Science departments.



DIPANKAR: I agree with what Projit is saying. Just like the Department of History, the Physics faculty has a strong research focus, with a steady output. At present two members of the Physics faculty are experimentalists and they are in the process of developing their laboratory facilities at Ashoka. These labs

already engage several PhD scholars and also senior undergraduates in the ongoing research programmes. This activity is definitely poised for a significant growth.

Going forward, we also expect to double the number of faculty members and look forward to a postdoctoral

programme that can serve as a major boost to research output. We are also looking to actively expand from the current research emphasis in the department, towards areas of quantum science, complex systems and emergent phenomena.

Q. Ashoka is one of the first universities to offer Astronomy as a discipline to undergraduate students. Dipankar, could you elaborate on how the department hopes to build and grow the Astrophysics programme?

DIPANKAR: The Astronomy Minor was started in January 2023 – with an already large bouquet of nine courses – presenting a unique curriculum covering much of modern Astronomy at an undergraduate level. The next step would be to introduce an Interdisciplinary Major in Physics and Astronomy in due course. Development of new course offerings in collaboration with Humanities departments are also under discussion. More hands-on

components will also be introduced as the laboratory facilities expand.

Over time, we plan to add research activities in the emerging areas of exoplanets, observational cosmology with large surveys and multi-messenger astronomy. In the next few years, researchers in India are poised to gain access to large international astronomical facilities. It will be our goal to train and involve the Ashoka students in the use of these facilities for state-of-the-art astronomical research

Q. What are some areas of growth that the Department of History will be focused on in the coming years?

PROJIT: In the longer term, I would love to see us teaching more non-Indian histories – particularly African history and the histories of other parts of Asia. Having worked for two decades in Europe and North America, I have always seen how world-class foreign universities like Oxford and Harvard all teach histories of various parts of the world.

The tendency in India is to usually focus almost exclusively on Indian history. But if we are to draw students from other parts of the world, or indeed produce students who can function in an increasingly globalised world, we must educate them in the deeper – and, in fact, often – shared

histories of India with our Asian and African neighbours.

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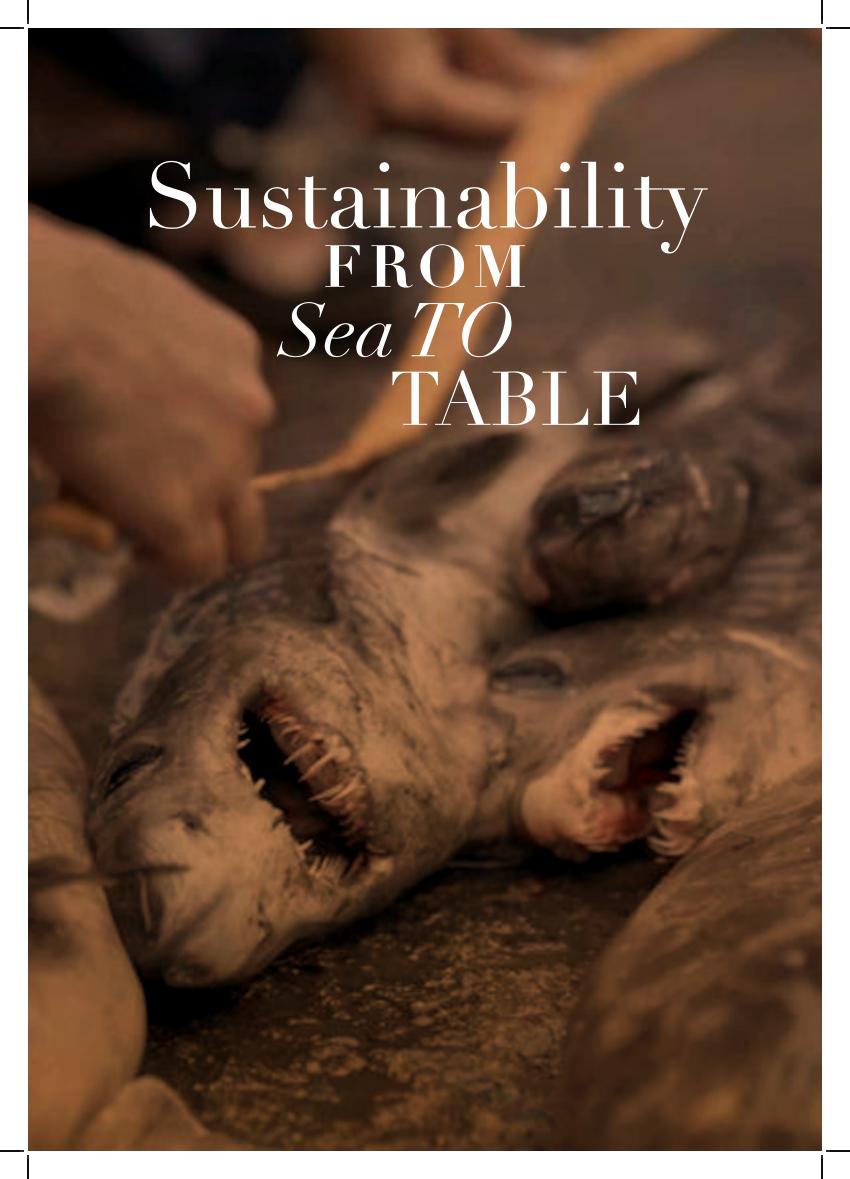
Given the ever-growing complexity of our socio-technical infrastructures, any future challenge will require us to think across disciplines.

Q. In your opinion, what makes interdisciplinary research important in today's context? In what ways is Ashoka equipped to handle this nature of work?

DIPANKAR: Ashoka is well on its way towards cultivating a research ecosystem that transcends disciplinary boundaries, and most of our departments exemplify this. Physics, in particular, offers numerous opportunities to develop collaborative and cross-disciplinary research with other departments. The department already has a significant overlap with Biology, through the study of biomaterials and epidemiology. Other developing collaborations include those with the Centre for Climate Change and Sustainability as well as the Departments of Chemistry and Computer Science.

PROJIT: None of the contemporary global issues that we face today – climate change, a global pandemic, increasing war and violence – can be tackled by any single discipline. By the time today's students become scientists, policymakers, economists, business people, poets and so forth, this trend is going to be even more pronounced. Given the ever-growing complexity of our socio-technical infrastructures, any future challenge will require us to think across disciplines.

Ashoka's unique blend of a liberal arts curriculum and an emphasis on research is ideal for equipping students for this transdisciplinary future. The bane of Indian higher education, in my view, is over specialisation from an early stage. On the other hand, some of the efforts to remedy this has led to instances in the clubbing of many distinct disciplines into a single department. Ashoka's model avoids these pitfalls.



Oceans are at the brink of exhaustion. They have absorbed our carbon and pollution and given us millions of tonnes of seafood. It is now time to give back. My research examines what we can do to make sure our interaction with the ocean is sustainable, without compromising economics or society. I study marine fisheries – a big indicator of ocean health – and examine how we can reduce our impact on marine animals that are threatened with extinction.

in India seem to hardly know anything about what they are eating. Instead, the same five or six species feature in our diet. This forces fishing communities to relentlessly chase those species, to the detriment of marine ecosystems. Fishing communities don't enjoy

chasing high-value fish. It means uncomfortable, sleepless nights onboard fishing boats that are not equipped for overnight stays, lacking basic facilities such as bathrooms.



My project, InSeason Fish uses a multidisciplinary approach to understand people's relationships with seafood and marine life.

Fishes are curious, emotional, social and intelligent. Their diversity varies from the vegetarian parrotfish that create white sand beaches, to

sharks that keep the ocean clear of carcasses. This diversity helps build the resilience of the ocean and ensures that nutritive content of every species is unique. India, as a tropical country, is blessed with a huge diversity of marine fish. Yet seafood eaters

The impact of InSeason Fish on restaurant sustainability was recognised by the 2023 Conde Nast Travel Award for Excellence in Culinary Conservation. We ought to eat what is ecologically available, i.e. at least hundred different edible species, each caught in small quantities, but together making a substantial haul for an individual fisherman. Equally as important as eating diverse fish, is knowing what not to eat. Sharks and rays, for instance, are highly threatened with extinction, but are increasingly showing up on restaurant menus. Even the species of rays that are not commercially important are still threatened by habitat loss and lack of awareness about the need for their protection.

Through InSeason Fish, I have brought these issues to light with the general public, resulting in a significant change among the attitudes of fish eaters and restaurants across India.

—DIVYA KARNAD

Divya Karnad is Assistant Professor of Environmental Studies at Ashoka. Her primary areas of work include marine conservation, fisheries management and the geography of seafood, climate and aquaculture. She has published in scientific journals such as Ambio, Biological Conservation, Conservation Biology, Marine Policy and the Proceedings of the National Academy of Science.

3. STUDENT RESEARCH

Ashoka fosters a deep culture of research

across departments – positioning it at the forefront of academic scholarship in the country.



Expanding HORIZONS: Our PhD PROGRAMME

Introduction

Ashoka's PhD programme was introduced in 2017. The University currently offers doctoral programmes in 11 disciplines – Biology, Chemistry, Computer Science, Sociology and Anthropology, Economics, English, Environmental Studies, History, Mathematics, Physics and Psychology.

The PhD programme carries a strong emphasis on foundational knowledge, academic research and hands-on experiences.

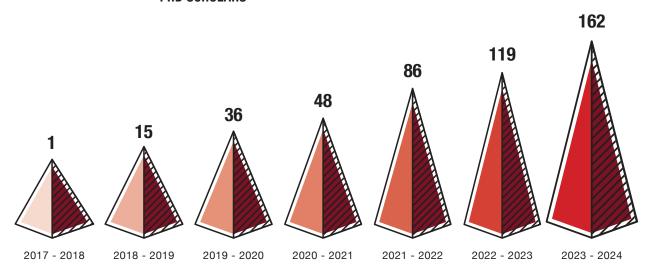
Key facets of the PhD programme:

- Interdisciplinary research, encompassing both fundamental and translational studies
- Partnerships with industry and policy-makers
- Integrating teaching with research

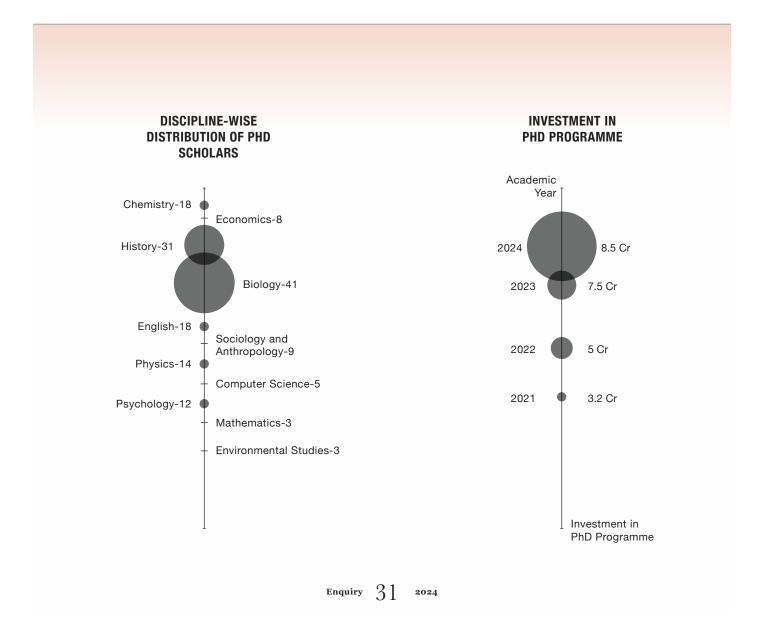
Ashoka envisions a future where researchers combine their intellectual pursuits with a strong commitment to solving societal issues.

Metrics

NUMBER OF PHD SCHOLARS



162 PhD scholars from 22 Indian states



Basabi Bagchi, from the Department of Biology, became Ashoka's first Science PhD graduate, in 2024.

Meet our first Science PhD Graduate

Basabi conducted research in the field of Evolutionary Biology, under the supervision of Imroze Khan (Assistant Dean of Research and Associate Professor of Biology).

Currently engaged in postdoctoral research at the University of Montana, Basabi's doctoral experience has equipped her to explore new projects and deepen her understanding of Evolutionary Biology. With a passion for both research and teaching, she aspires to pursue a career in academia.





Hand-me-down: How infections affect genes

The immune responses of our body against harmful diseases can cause unintended damage to healthy tissues and cause mutations in the DNA sequence. Basabi's research focused on studying the transgenerational inheritance of genetic errors. She worked with a species of beetle, *Tribolium castaneum*, infecting them to observe how mutations induced by infection could be passed down to future generations. Basabi's research exhibited how infection in parents can lead to progressive decline in progeny fitness over generations.

She then delved deep to understand whether evolution could offer a solution to mitigate these harmful effects. Further experiments with *Tribolium* lines subjected to intense pathogen exposures over multiple generations helped answer this question. She found that the evolved lines exhibited a significant reduction in mutation transmission to subsequent generations and continued to produce healthy offspring despite facing infections. This suggested a rapid evolution of germline repair mechanisms to counteract the infection. Thus, her study revealed the transmission of mutations could have an unrecognised cost of immunity. It also demonstrates the ability of organisms to adapt to adverse conditions. The implications of this study spans beyond the confines of the laboratory, offering profound insights into disease, evolution and host-pathogen dynamics.

Basabi's interest in understanding the various facets of the immune system's evolution led her to choose Ashoka for her PhD.

The Evolutionary Immunology Lab

Most organisms have elaborate and complex immune systems but the understanding of how such complexity and diversity evolved in natural populations has been surprisingly limited. However, with the frequent emergence of disease-causing pathogens in recent decades, an understanding of the fundamental aspects of evolving immune strategies has become a pressing need.

The Evolutionary Immunology Lab at Ashoka, led by Imroze Khan, is working towards developing this understanding – by tracking the rapid divergence and evolution of the immune system in insect models. Members of the lab employ diverse methods from

theoretical modelling, population biology, experimental evolution and genetic and genomic methods to unravel the complexities of evolving immune responses.

Research projects at the lab are supported by DBT - Wellcome Trust India Alliance and SERB-DST.

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HOW Ashoka NURTURES STUDENT Researchers

INTRODUCTION

The Ashoka experience remains unparalleled in the Indian higher education ecosystem – with a focus on not just strong foundational knowledge, but also on critical thinking. The University encourages students to deep dive into subjects, to ask the right questions and to explore connections across disciplines.

With a robust environment that supports the research pursuits of not just faculty, but also students, the University is creating an unrivalled ecosystem that is on the path to producing the next generation of world-class researchers.



Beyond the experiment: Navigating molecular landscapes with Computational Chemistry

Saurabh Parmar's (PhD Scholar, Chemistry) research delves into the intricate world of catalysts in organic reaction mechanisms, exploring their molecular structures and interactions through advanced computational methods such as Density Functional Theory (DFT).

One of his ongoing projects involves predicting the efficiency of converting

carbon dioxide, using homogenous metal catalysts. The computationally designed catalysts possess unique attributes – they are easy to synthesise, chemically robust and cost-effective. Another strand of his work applies DFT to address critical questions in gold-catalysed reactions, seeking answers to queries as to why a specific group of substrates forms the desired product, while others remain unreactive.

Saurabh has, with Vidya Avasare (Professor of Chemistry), jointly published in several journals, including *The Journal of Physical Chemistry A, ChemPhysChem* and *Frontiers in Chemistry.*



Cellular chronicles: Unravelling the role of mitochondria in ageing and related

diseases



Akshara Kulkarni (ASP 2024, Biology) is pursuing research under the supervision of Kasturi Mitra (Associate Professor of Biology). The primary objective of Akshara's project is to gain quantitative insights into how mitochondrial structures influence the establishment of the senescent cells - cells that permanently cease further division. Akshara's project

uses the MITOSIM2 approach, which involves monitoring single mitochondria. It aims to, first, develop a quality control pipeline for MITOSIM2 images to yield most accurate results, and then apply the method to study the role of mitochondria in senescence.

Akshara's research group expects to address questions such as whether mitochondria in senescent cells tend to be longer or shorter, more connected or less and how a particular structural configuration affects the senescent properties of the cell. Long-term goals would include exploring factors that drive senescence, thereby developing a deeper understanding of the specific role mitochondria may play in ageing and diseases such as Alzheimer's and cancer.

Exploring the role of topology in biological phase transitions

Souradeep Sengupta's (PhD Scholar, Physics) research is primarily focused on Theoretical and Computational Biophysics. He is working to understand the phenomenon of DNA melting, which happens when two strands of DNA unwind during processes such as cell division.

He specifically investigates circular DNA, common in viruses and bacteria, which behaves differently from linear DNA found in humans.

His research looks at how the topology of circular DNA affects the melting phase transition, using statistical physics models and dynamical simulation run on Ashoka's High-Performance Computing clusters. The findings reveal that in the absence of further twisting or supercoiling, circular DNA behaves similar to linear DNA

The interdisciplinary ecosystem at the University creates a vibrant environment for student researchers.

Enquiry 35 The culture of collaboration, between faculty and students and within academic departments, is what makes the research enterprise at Ashoka stand out.

Biological systems are enormously complex and hard to grasp in their totality – this is where interdisciplinary approaches from Physics can help delineate the importance of different aspects of biological systems. Souradeep's work is situated in this context and will contribute to the multidisciplinary effort to demystify Human Biology. Along with his advisors, Somendra Bhattacharjee (Professor of Physics) and Garima Mishra (Assistant Professor of Physics), Souradeep has written a paper based on this project. This has been accepted for publication by the journal, *Physical Chemistry Chemical Physics*.

Investigating the impact of pre-natal temperature variability on children's education



Nandini Krishnan (ASP 2024, Economics) is exploring how temperature changes during pregnancy impact a child's educational outcomes in Indonesia.

Her study utilises temperature data from MERRA-2 (NASA) and three rounds of the Indonesian Family Life Survey (IFLS) for analysis. By employing statistical

methods and practical approaches, the research examines how prenatal exposure to temperature variations influences academic performance. Previous studies have shown that higher temperatures during pregnancy can impair cognitive abilities, affecting long-term human capital and reducing overall productivity. Nandini's research aims to inform policy by highlighting the need to strengthen healthcare systems and support pregnant women in coping with temperature variability. This work also addresses how climate change could affect national growth, contributing valuable insights to the broader policy discourse.

Exploring the intersection between Computer Science and social development

During his time at Ashoka, Soham De (ASP 2023, Computer

Science) collaborated with over a dozen researchers from around the world to work on 'Information and Communication Technologies for Development' (ICT4D). His focus has primarily been on understanding how propaganda and misinformation spreads on X (formerly Twitter). Soham, along with the larger research team, has published multiple papers analysing the subtle aspects of how politicians use X, their interactions





with defence personnel, how journalists create and spread information and the penetration of fact-checking environments on the platform. Notably, Soham has published in journals such as ACM Journal on Computing and Sustainable Societies and ICTD '22: Proceedings of the 2022 International Conference on Information and Communication Technologies and Development.

Soham is currently pursuing a PhD at the University of Washington, where he is part of the Center for Informed Public.

Qualifying Quality in Higher Education in Kerala

Deepti Sreeram's (PhD Scholar, Sociology and Anthropology) thesis attempts to unpack the idea of 'quality' in higher education — exploring how one can qualify a highly subjective concept such as quality. There exists enough evidence to suggest that students, faculty members and other stakeholders consider quality differently. Deepti's work specifically looks at the state of Kerala, which has often been described as an exceptional model for other states in India, especially in areas

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of literacy and education. Despite this history, there have been claims that the state's education is in decline. It is in this context that Deepti's research question is significant in understanding the shifting dynamics of higher education.

Her study is primarily ethnographic with a focus on the customs, behaviours and

cultures of different groups of people. She also maps institutional histories and traces the ways in which the institution where she conducts research, conceptualised quality over the years. She actively follows the media discourse on higher education in Kerala to understand the ways in which quality education is discussed among different stakeholders.

Remapping domestic violence as a form of complex trauma

Maitrayee Sen's (PhD Scholar, Psychology) thesis investigates the spectrum of relationship violence against ever-partnered Indian women, particularly in the form of Intimate Partner Violence (IPV). Existing literature often indulges in episodic framing of issues pertaining to domestic violence, thereby failing to capture the nuanced psychological consequences of sustained and repetitive domestic

violence.

Maitrayee's research argues for a continuous trauma framework to better map the pervasive nature of domestic violence in India. Preliminary data from her research suggests that ever-partnered Indian women (defined as women who are or have been married, cohabit or have a long-term sexual partner) trapped in

a long-term sexual partner) trapped in abusive relationships often display psychological disturbances – including interpersonal disturbances, negative self-concept and extensive physical symptoms.

Once the feasibility of complex trauma theory is established as a backbone, several structured intervention programmes can be standardised and scaled. The programmes, formulated with the help of this theory, will help survivors in a culturally and contextually sensitive manner.

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4.

RESEARCH INFRASTRUCTURE

Equipped with the best-in-class facilities,

the research community at Ashoka is positioned to drive innovation, change and growth in the years ahead.





Unveiling Ashoka's CuttingEdge Research Infrastructure

With a steadfast commitment to fostering groundbreaking research across the Physical, Natural and Social Sciences

as well as Humanities, Ashoka has continually invested in top-notch facilities, cutting-edge equipment and a supportive environment conducive to scholarly exploration.

A flagship component of Ashoka's research infrastructure is the HDFC Library. Boasting of an attractive layout and state-of-the-art amenities, including rare book collections, archives and extensive electronic support, the Library caters to diverse user needs and offers services like digital curation, inter-library loans and remote access to e-resources.

The Science laboratories, spanning multiple disciplines, are equipped to cater to diverse research interests and requirements. The campus has advanced imaging facilities, a behavioural Biology facility, clean rooms, insect and plant research facilities, soft matter and fluid dynamics lab, Astronomy-Physics facility and a

magnetic characterisation lab. Ashoka also has advanced preparative and analytical instrumentation such as highend spectrometers, high-speed centrifuge, flow cytometer, and more.

Additionally, the University has partnered with Carl Zeiss India to establish a state-of-the-art Core Imaging Facility. Zeiss will provide the latest cutting-edge microscopy technology to the University, including high-resolution, super-resolution and high-content microscopes.

For Social Sciences and Humanities research, researchers have access to software tools like MATLAB, Mathematica, Zoho, SurveyMonkey and others. Digital Humanities benefit from software such as Quantum GIS, Mapbox, Leaflet and dynamic data visualisation tools. Researchers also have access to GitHub for code sharing, programming languages such as Python and SQL, various database management systems, as well as content management and digital exhibition systems.

Advanced eye tracker systems and custom sleep deprivation apparatus enhance Psychology labs. Visual and

Performing Arts thrive in the high-end Black Box Theatre and dance studio. Media Studies benefit from state-of-the-art production facilities, including live production control rooms, top-tier cameras, cloud-based databases for stock music, and more.

Ashoka University is home to several Centres of Excellence, each committed to addressing contemporary societal challenges. These Centres serve as interdisciplinary hubs, uniting experts from diverse fields to address complex issues from various perspectives. Research conducted at these centres is enhanced to deliver impactful solutions to issues relevant to our context.

In addition to physical infrastructure, Ashoka supports researchers by providing access to high-quality data and information resources. The University's commitment to open access and data sharing provides researchers with a wealth of information, facilitating collaboration

and innovation within the academic community. As Ashoka expands its research initiatives, its ongoing investment in research infrastructure will remain pivotal in driving innovation and facilitating new discoveries.

Equipped with the best-inclass facilities, the research community

community
at Ashoka is
positioned to drive
innovation, change
and growth in the

years ahead.

Infrastructure funding



ACADEMIC YEAR 2018 - 2019

AMOUNT INVESTED (INR) 93.94 Cr

MAGNONICS



A NEW AVENUE FOR LOW-LOSS AND **FASTER SPINWAVE BASED DEVICES**

Susmita Saha (Assistant Professor, Physics) and Riva Mehta (PhD Scholar, Physics)

Susmita Saha leads the Complex Magnetic Characterisation Lab at Ashoka, focusing on magnetisation dynamics of magnetic thin films and nanostructures.

In 1959, the American theoretical physicist, Richard Feynman highlighted potential for technological developments at the nanoscale manipulating matter at atomic, molecular and supramolecular scale - during a lecture at the California Institute of Technology. This lecture played an instrumental role in generating considerable interest in the field, and ultimately led to Professor Norio Taniguchi introducing two new research fields, Nanoscience and Nanotechnology.

One of the most intriguing branches that is currently emerging within Nanoscience is Nano magnetism. This involves studying magnetic phenomena in submicron-sized (smaller than a grain of sand) magnetic structures. The reduction in size drastically modifies the magnetic properties of materials. Nanomagnets have numerous applications in modern technology, including magnetic data storage devices, non-volatile magnetic

memory, magnetic logic devices, sensors and several applications in Biomedicine and Biotechnology.

In today's world, there is a growing demand for wireless communications, especially with the emergence of the Internet of Things (IoT). This necessitates the need for small and energy-efficient devices capable of handling highfrequency microwave signals and ensuring faster data transfer consistently. Existing electronic technology faces problems like power loss due to Joule heating. Hence, there is a pressing need for a more efficient technology to meet these demands.

We commonly hear about electronics, utilising the charge of electrons for devices. In Spintronics, we harness the spin of electrons. When a magnetic material is disrupted, the disturbance travels as a spin wave - imagine ripples from a stone thrown into still water. These spin waves can transmit information, and their quantisation is termed as magnon. This emergent research field is referred to as Magnonics, which is the area we work in. Magnonics holds the promise of a new-generation of energy-efficient devices, which have emerged as an alternative candidate to existing modern electronic technology.

One key aspect of our research is the control of spinwaves in magnetic nanostructures. This not only addresses fundamental questions concerning Magnonics, but also has the potential to contribute to the development of a new generation of spinwave-based, lowpower consuming, faster devices.

Recently, we have published our work on the spinwave dynamics of magnetic fractals. Fractals refer to patterns in magnetic materials that exhibit a selfrepeating or self-similar geometric design at different scales. These patterns arise due to the complex interactions and arrangements of magnetic elements within the material. Our study established that these structures can act as filters for spinwaves, which has important implications for future technology.

So far, we have also uncovered evidence of super-diffusive THz (terahertz) spin current during a rapid demagnetisation process. This is especially crucial for developing advanced THz-based devices that could revolutionise communication, imaging and beyond. Our work, thus, is invested in a future where technology is faster, more efficient and environmentally friendly.

ACADEMIC YEAR 2019 - 2020

AMOUNT INVESTED (INR) 95.52 Cr



ACADEMIC YEAR 2020 - 2021

AMOUNT INVESTED (INR) 66.60 Cr



ACADEMIC YEAR 2021 - 2022

AMOUNT INVESTED (INR) 95.01 Cr

ACADEMIC YEAR 2022 - 2023

AMOUNT INVESTED (INR) 226.2 Cr



PHOTON UP-CONVERSION

ADVANCING LIGHT-BASED TECHNOLOGIES

Deepak Asthana leads the Molecular Materials Lab at Ashoka, with a keen interest in designing new molecular materials for opto-electronic applications such as solar cells, biophotonics and optical storage devices.

Light carries energy in the form of small packets called photons. The energy of any photon is given by $E = hv = hc/\lambda$, where h is Planck's constant, c is the speed of light, and λ is the wavelength of the photon.

Light-based devices or light-triggered processes such as photocatalysis, photovoltaicsor phototherapy, respond selectively to particular wavelengths of incident light. In such cases, materials that can increase

the energy of incident light can improve the efficiencies significantly. Consider a photovoltaic cell (one that converts solar energy into electricity) operating under visible light with a layer of photon up-converting materials. The presence of photon up-converting materials would ensure the conversion of low-energy (near-infrared) photons into higher-energy (visible) photons, thereby resulting in increased electricity production under similar conditions.

Similarly, in biomedical processes, near-infrared light can penetrate much deeper into tissue cells than visible light. Therefore, photon up-conversion can be employed to initiate reactions that require visible light to function effectively.

In short, photon up-conversion is a process that offers a means to modulate the energy of light by reducing the wavelength (λ) of incident radiation or photons. Typically, when light interacts with matter it loses its energy. Photon up-conversion, however, is contrary to this natural process, and is therefore challenging to achieve.



Deepak Asthana (Assistant Professor, Chemistry) and Alisha Sengupta (PhD Scholar, Chemistry)

In our laboratory at the Department of Chemistry, we are focused on designing and synthesising new materials capable of up-converting energy from low-intensity light sources, such as solar irradiation. Through the application of

synthetic chemistry tools, our goal is to develop two types of materials:

- Molecules capable of performing photon up-conversion under sunlight illumination
- Water-soluble/dispersible molecules capable of photon upconversion of near-infrared (NIR) light.

The first type of molecules will find applications in solar energy-based devices and processes, whereas the second type of materials will have direct relevance in bio-imaging and photodynamic therapy.

To advance our research in photon up-conversion, we have established a robust collaboration with Nobuhiro Yanai's laboratory at Kyushu University, Japan. We are in the process of setting up our own measurement facility in the laboratory at Ashoka. We also recently published a review article that describes the strategies to achieve and amplify photon up-conversion in the journal, *Nanoscale*.



SURVEILLANCE OF ANTIMICROBIAL RESISTANCE IN WASTEWATER

Laasya Samhita (Assistant Professor, Biology), Gulafsha Khan (Senior Research Fellow, Biology)

Laasya Samhita is the Principal Investigator at the Mistranslation and Resistance to Antibiotics (MIRA) Lab at Ashoka. The lab is primarily interested in understanding the role of non-genetic variations in influencing adaptation and evolution.

Water is an indispensable shared community resource. Work done during the recent pandemic has highlighted the role of water contamination in disease transmission. It has also underlined the importance of periodic surveillance to monitor public health and predict upcoming disease trends. In particular, both the World Health Organisation (WHO) and the Indian Council of Medical Research (ICMR) in India have recognised resistance to antimicrobials (AMR) as a global threat to public health, poised to overwhelm the modern healthcare system as it makes our current drugs of choice ineffective. Wastewater from domestic use, industry and agriculture is





frequently contaminated with bacteria resistant to various antibiotics. By periodically sampling local wastewater, we are building a systematic spatio-temporal record, tracking local patterns of resistance over time.

Over the last nine months, our group has extracted DNA from wastewater samples across 20 sites spread over three types of communities – a semi-closed academic community (Ashoka University campus), a peri-urban and agricultural community (Sonipat) and a densely populated urban community (Delhi-NCR region) to build an extensive database. This will help monitor how key clinically relevant bacterial pathogens and AMR gene levels rise and fall across time and locations.

We employ DNA sequencing techniques, with high output, to extract both qualitative (presence/absence) quantitative (how many bacteria/ genes) data from the collected DNA. The problem of AMR involves several stakeholders, ranging from clinicians and farmers to scientists, policy makers and funders. As such, any attempt to tackle it must ultimately be collaborative. In order to access domestic sewage treatment plants, we liaise with local municipal corporations. To access the latest innovations from industry, we stay in touch with both technical and sales personnel.

We analyse our raw data using expertise from computer scientists and ask questions such as these: How does the load of AMR genes and their diversity change over time and across seasons? Does the wastewater profile of AMR

reflect what is seen in the clinic, or are we looking at a separate milieu altogether? Addressing these and other questions will, in the long term, help us understand how AMR is spread, inform policy and clinicians, and develop advance warning systems. For example, if we observe a high level of resistance to amoxicillin in the local water, it would be a good idea for local doctors to avoid prescribing amoxicillin until the trend changes.

In the long-term, our goal is to inform policy and antibiotic stewardship, by curating a local database that would potentially aid in the prevention of AMR spread.



5. SPOTLIGHT

The Centre for Interdisciplinary Archaeology,

first-of-its-kind in India, brings together Archaeology and the Sciences to offer new perspectives on Indian history.







The Centre for Interdisciplinary Archaeological Research (CIAR), aims to provide new insights into India's rich past through an integration of Archaeology and the Sciences. Through field projects led by Ashoka faculty and students, complemented by laboratory work, CIAR endeavours to explore diverse landscapes and archaeological sites across India.

CIAR focuses primarily on research and researchbased teaching. The Centre integrates the two, offering innovative courses that bring together Archaeology with Sciences and Humanities. CIAR's commitment to immersive learning is evident in its localitybased course - Sites and Sights which delves into the history of Sonipat and surrounding areas. This course, by combining classroom learning with visits, provides students with hands-on research experience.

On the research front, CIAR operates at three different levels. Undergraduate students engage in meaningful research through a unique

Overview:

Centre for
Interdisciplinary
Archaeological
Research

initiative where they submit proposals for research projects and receive a small fund for their work. Their topics

range from Ethnography and Archaeology, to the interface of Computer Sciences with Archaeology.

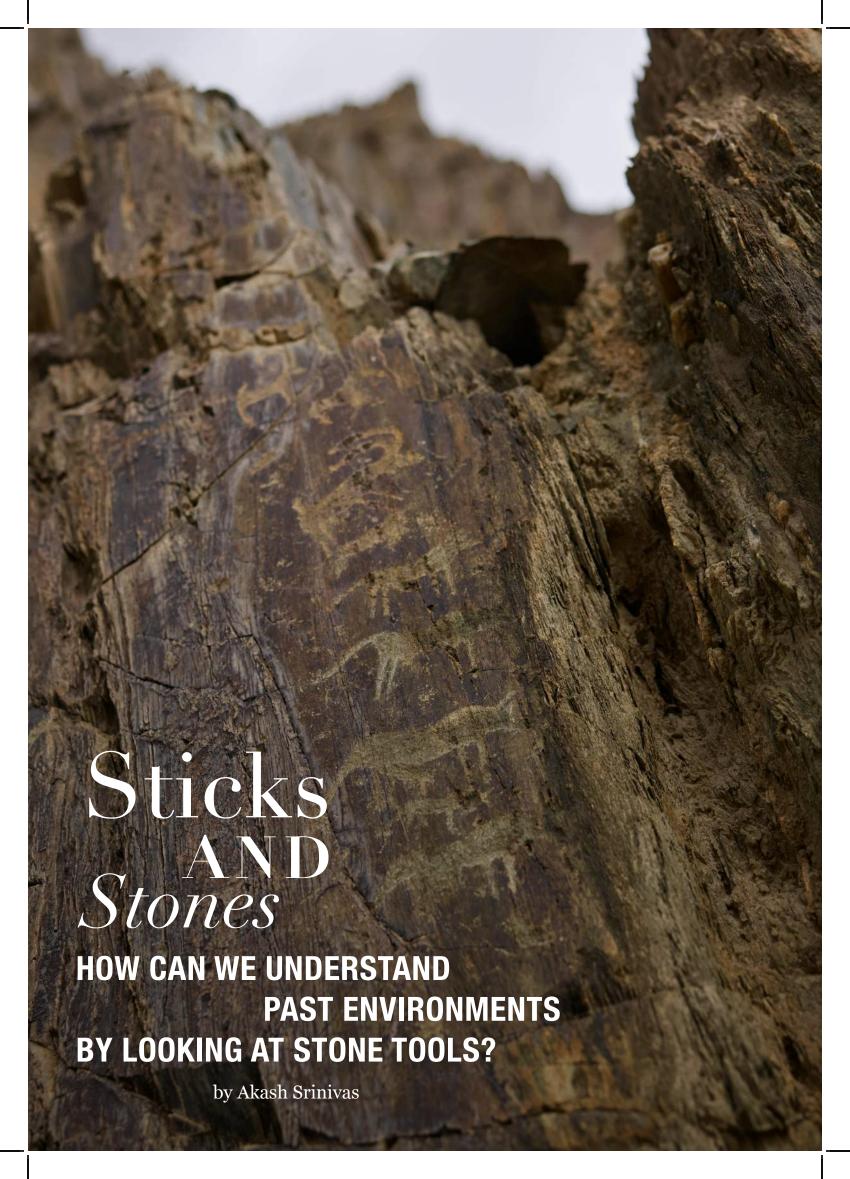
CIAR also offers the Ashoka Fellowships in Ancient and Medieval Indian History/ Archaeology, attracting postdoctoral scholars from diverse backgrounds pursue research 2022-23, projects. In the papers published by the Ashoka Fellows showcased the diversity of their expertise.

The Centre boasts of a team dedicated to pushing the boundaries of archaeological research.

From pottery and isotope analysis to prehistoric studies and epigraphy, CIAR's researchers employ cutting-edge techniques and interdisciplinary approaches to unravel the mysteries of India's past.

Supported by generous contributions from Anupa and Rajiv Sahney, CIAR's Bandhavgarh project exemplifies its commitment to interdisciplinary research. Through collaborations with various national and international institutions and experts across diverse fields, CIAR endeavours to expand knowledge and foster innovation in archaeological research.





he study of our past is rooted in a variety of written and material evidences. Studies suggest that stone tools predate our species, Homo sapiens, by at least 2.7 million years. In South Asia, stone tools can be dated back to at least 2 million years ago. Despite the antiquity of such evidences, the oldest writing that we know of is only around 5,000 years old. Thus, the onus is on Prehistoric Archaeology - the branch of study that deals with the time period before the invention of writing - to inform us of most of our past. And due to their durable nature, stone tools become our eyes into this deep past. They give us an insight into where, when and how ancient peoples lived, what they ate and, at times, even what they thought.

One important and pressing aspect of studying the past focuses on how we were shaped, and in turn, adapted to and shaped our environmental conditions. The kind of plants and animals that surrounded us; the weather; the available water sources; and even the ground and surfaces that we lived on. By their very presence, the kind of rocks and stones available affected the kind of resources these ancient populations could work with. A study of stone tools - their technology and their processes of manufacture - thus, acts as a window to prehistoric adaptation strategies, also giving us an insight into the various palaeoenvironmental conditions that populations had to adapt to.

During my time at the Centre, I have been able to work with stone tool collections from various places and regional settings. These include sites in Bandhavgarh National Park, Madhya Pradesh; Melghat Tiger Reserve, Maharashtra; the Central

A study of stone tools their technology and their
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Narmada Valley, Madhya Pradesh; and the Deccan Plateau in Karnataka.

What we note from these studies is that these ancient stone-tool makers had an in-depth and detailed understanding of their environmental surroundings. They were readily able to accommodate and modify their mental templates to apply onto the variously present rock resources. In areas where river cobbles were abundant, they developed innovative ways to use these sources which were otherwise relatively difficult to exploit using traditional stone technological processes. In other regions, such as the hill slopes of Karnataka and Madhya Pradesh, they used the readily available disintegrated natural rock, to minimise their energy costs. And in the rich forest lands, they crafted complex tools to hunt

the swift and agile fauna around them.

Thus, these ancient tool-making stone peoples have shown how humans 115 have always been able to adapt to their environmental settings, to live and co-exist with their surroundings. association with CIAR, has thus helped me chip away at the large unknown puzzle reconstructing our collective past especially to uncover the environmental bases for adaptive strategies.

Akash Srinivas is a Postdoctoral
Fellow at the Centre for
Interdisciplinary Archaeological
Research. He is a prehistoric
archaeologist and his research
interests primarily concern
Palaeoanthropology and
Palaeolithic Archaeology. He is
currently engaged in the study
of the nature and variability of
stone tool technology of the South
Asian Lower Palaeolithic region
and characterising the nature of
Palaeolithic occupation in southern
Karnataka.







INTERNSHIP BRIEFS

Aneesh Sriram, Undergraduate 2025



What does the antiquity and the material past of the areas around Ashoka University look like? My research for the Centre's internship programme stems from the curiosity of mapping the archaeological landscape of Sonipat

district. My research through remote sensing and secondary data over the last few months has identified six partially disturbed archaeological mounds and sites, all within a 20 km radius of the Ashoka campus.

Field visits have been conducted to three of these sites till now - Harsana Khurd, Sewli and Ladpur. Overall, these mounds have revealed the presence of past material remains in the form of potsherds ranging from the protohistoric (2500 BCE), painted grey ware (8th century BCE), early historic (3rd century BCE-5th century CE), and the medieval periods (7th century CE and beyond).

My explorations will continue around the environs of Sonipat to both identify and document sites which present archaeological potential. Given a vast chronology of occupation in this area, how does one situate the ancient settlements in relation to water sources like the Yamuna? With the progress of remote sensing and other surveying techniques, can other such sites be identified and documented in the area? Questions such as these are key to my future research in this area which will ultimately act as a window to further decipher the interface of ancient humans and the environment in the floodplain.

Shirsha Chanda, **Undergraduate 2025**

Starting November 2023, I have been working under Professor Kalyan Sekhar Chakraborty, and together we are mapping out ancient and early historic (1500 BCE - 800 CE) human-animal interactions across the northern part of the subcontinent. The ancient Indian subsistence base was heavily reliant on agriculture and animal husbandry, with cattle being the driving force behind the economic and social life of people across the subcontinent ever since their domestication.

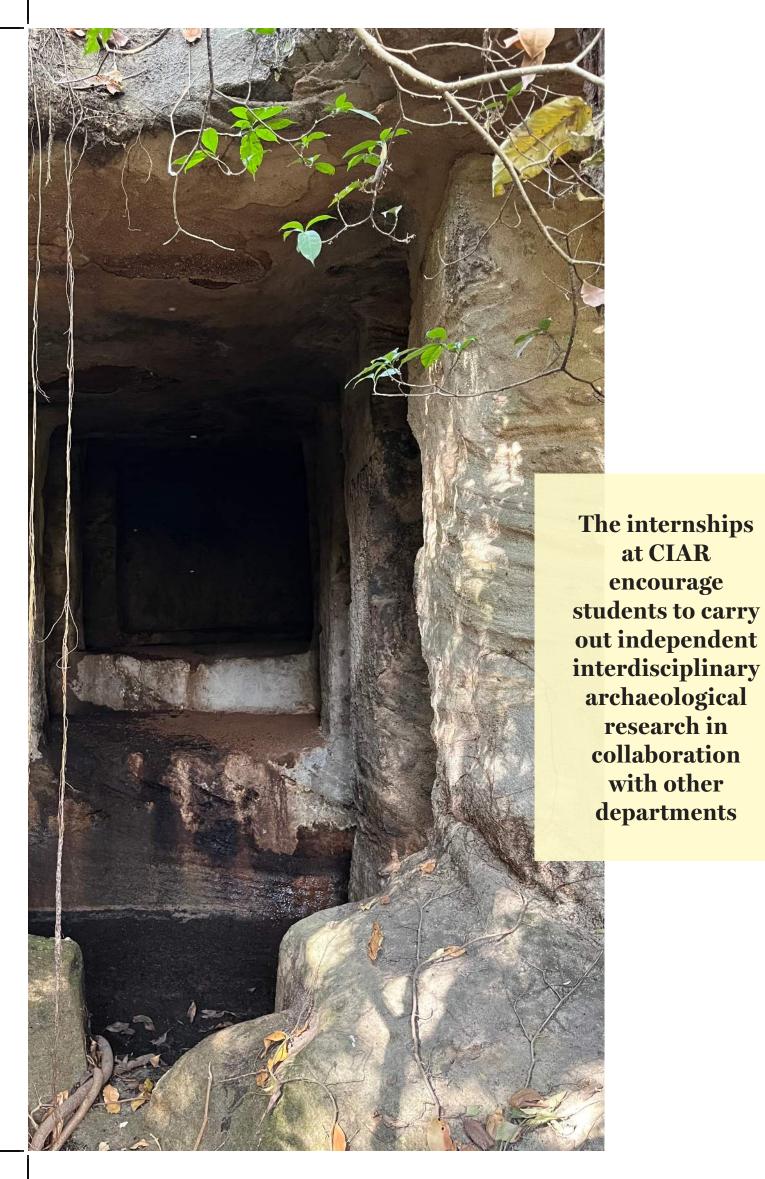
The importance of cattle can be noted from the wide assortment of texts being composed in and around the Ganga Valley pertaining to and referring to them, but what do we know about the specificities? By conducting a rigorous literature review of texts such as Rigveda, Arthasastra, Krsiparasara, I seek to answer several questions - how did the ancient Indian landscape look with regards to cattle management;

how did these techniques of management change over centuries; how were they worked; what were their seasonal grazing patterns?

Through the course of my research, I have encountered an almost unending supply of information about my topic. Hence, this will also be the

topic of my final year thesis - which will outline changes across a broader time period and will involve fieldwork and ethnography. This will mostly centre around Rakhigarhi, a village in Hisar, Haryana – a perfect intersection between the ancient, medieval and modern periods, with a primary economy based on cattle.





ASHOKA FELLOWSHIPS IN ANCIENT AND MEDIEVAL INDIAN HISTORY-ARCHAEOLOGY

Established with generous funding from Anupa Sahney, the Fellowship aims to encourage field research, interdisciplinary collaboration and documentation of archaeological remains, museum collections, manuscripts, vernacular writings and archives.

The Fellowship is for a period of 18 months, and fellows are expected to publish scholarly articles on the work they undertake at Ashoka.

In the year 2022-23, the Fellowship was awarded to two scholars – Abdul Rashid Lone (Department of History, University of Kashmir) and Aditi Mann (Vivekananda School of Law and Legal Studies). During their time at CIAR, they undertook field projects in Kashmir and Haryana, respectively.

uring my year as an Ashoka Fellow, I conducted research across three districts in Kashmir – Anantnag, Ganderbal and Pulwama, covering various early historic sites. This shed light on the region's rich historical and cultural heritage spanning multiple periods.

Beginning with the Ichnad settlement in Anantnag district, initial investigations unveiled intriguing artefacts such as pottery sherds, Kushana period bricks and a fragmented stone sculpture at the lower foothill. Subsequent visits to the area revealed a second settlement. This secondary site yielded a trove of discoveries including

huge terracotta storage jars, additional pottery sherds and architectural remnants indicative of habitation. Notably, the analysis of these findings suggested a division in the settlement's chronology, with the lower terrace dating back to the Kushana period and the upper area likely serving as a defence station during the early medieval era.

At the Neolithic settlement of Pethpuran in the Ganderbal district, the survey uncovered evidence of significant

VISITS TO SECONDARY

ARCHAEOLOGICAL SURVEYS
IN ICHNAD, PETHPURAN AND
RENZIPORA



occupation, with pottery fragments and stone tools providing insight into the technological advancements and settlement patterns of the time. Particularly noteworthy was the discovery of a grinding/anvil stone, a rare find in the Neolithic context of Kashmir, suggesting sophisticated tool fabrication practices.

At Renzipora, an early historic site in Pulwama district, the archaeological exploration unveiled a diverse array of artefacts spanning different historical periods. Among the discoveries were terracotta tiles, figurines and diaper pebble walls indicative of early historic occupation. Notably, atop the site, evidence of the early medieval period emerged with the unearthing of huge storage jars and terracotta figurines. Additionally, stone pestles and ring stones were also found, suggesting the utilisation of the site for various purposes over time. In the low-lying areas, antiquities dating back to the Kushana period were documented, including storage jars and an in-situ diaper pebble wall.



KURUKSHETRA



AN ARCHAEOLOGICAL PERSPECTIVE

By Aditi Mann

As a part of the Fellowship, my research primarily focused on Kurukshetra district of Haryana. It is known for the war of Mahābhārata and is a popular pilgrimage centre. The intention of the research

was to examine the transformation of Kurukshetra since ancient times on the basis of stone sculptures and other archaeological remains which have been recovered so far.

The site revealed many archaeological objects in the form of terracottas, stone sculptures and inscriptions which shed light on the existence of five cults of the Brahmanical faith – Śaivism, Vaiṣṇavism, Śakta, Gaṇapatya and Saura – besides Buddhism and Jainism as well. However, the

nature of the site changed with the popularity of the Kṛiṣhṇa cult. The research also examined the role of state and popular culture in defining and altering the sacred landscape.

In continuance with the first strand of research, my second paper with CIAR examined the existence and influence of the $S\bar{u}rya$ cult, or sun-worship, in the religious landscape of Kurukshetra, from an archaeological perspective. Sunworship is one of the most ancient religious traditions which is still practised by people across India. This paper was largely based on the anthropological study of tirthas or pilgrimage sites of Lord tirthas or pilgrimage sites of Lord tirthas (Sun-God) with the focus on the ancient site Amin which is popular as his birth place and has also been mentioned in ancient literature.

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THE ANCIENT ROUTE FROM SIMPLE TO COMPLEX

By Kalyan Sekhar Chakraborty

Kalyan Sekhar Chakraborty is Assistant Professor of History. He specialises in Biomolecular Archaeology and Archaeological Geochemistry, with research interests in reconstructing ancient animal herding practices. He is also pursuing postdoctoral research at the Max-Planck Institute for the Science of Human History as an Alexander von Humboldt Postdoctoral Fellow.

hy humans transitioned from simple kin-based foraging societies to more complex urban civilisations - where in-group members had to give up their autonomous choices and personal benefits for the benefit of other out-group members - has long baffled archaeologists and anthropologists worldwide. South Asia, and in particular India, serves as one of the few perfect places for an investigation of the changes that may have led to this transition. These changes were most noticeable in political decisions, sociocultural practices and patterns of broad subsistence economy. This region has witnessed not only the emergence of one of the earliest civilisations but is also where human habitation has continued for more than 1.65 million years.





There is no single answer to this question, and the emergence of sophisticated urban societies from simpler foraging societies may have taken quite distinct paths in different parts of the world. At the Centre for Interdisciplinary Archaeological Research, my research specifically aims to answer the following questions - what caused the first urbanisation in South Asia approximately 6,000 years ago? How did this early civilisation survive for thousands of years? What may have been the internal or external forces that resulted in this civilisation's decline? And what may have caused the reappearance of small-scale, kin-based agro-pastoral societies?

The Marxist model identifies a few key factors as the primary drivers of inequality. These include economic specialisation,

creation of surplus beyond immediate consumption and environmental conditions - both favourable as well as extreme climatic events. These are thus, also to be perceived as the factors resulting in the emergence of complex societies. Sadly, India lacks both theoretical and empirical research that focuses on the reasons why complex societies emerged in India and why their initial manifestations differed throughout South

Asia. North-Western India experienced urbanisation and large-scale non-kin-based societies with extensive commonalities, in the form of the Harappan Civilisation. However, the neighbouring regions of Northern, Central, Eastern and Southern India

continued to maintain kin-based small-scale foraging and agro-pastoral settlements during the mid-Holocene period, roughly 5,000 to 7,000 years ago.

My research attempts to understand human-environment-animal interaction and their role in the emergence, maintenance and decline of the first urban society in India by studying two kinds of sources. The first is, lipid and protein food residues that remained in archaeological pottery. Additionally, I also analyse the isotopic composition of human and animal skeletal remains from various archaeological assemblages. I do this by using a suite of advanced biomolecular and isotopic techniques.

My research aims to reconstruct several aspects of the agro-pastoral societies that came up. The most important of these is the emergence and intensification of secondary animal products like dairy; animal management practices like mobility and foddering; and the growing influence of non-kin interaction and major climatic events on animal consumption and management practices. I examine the emergence of pastoralism as a specialised subsistence economy in India, using biogeochemical techniques, along with anthropological theories. I am also studying past human nutrition and the effects of increasing inequality and climatic events on human health and subsistence practices.

"At the Centre for Interdisciplinary Archaeological Research, my research specifically aims to answer the following question - what caused the first urbanisation in South Asia approximately 6,000 years ago?"

6. PARTNERSHIPS

By leveraging partnerships across the globe,

Ashoka is paving the way for seminal research and innovation to create meaningful outcomes.







Research Partnerships

As Ashoka marks its 10th anniversary, we reflect on the excellent reputation already established as India's leading interdisciplinary, Liberal Arts and Sciences university. The University has demonstrated the idea of a world-class, internationally connected institution based in India, delivering not just an

outstanding student experience but also successful pathways into postgraduate education and into the workplace.

The recent focus on developing global research alliances

aims to create opportunities to engage with the world's best research institutions to achieve mutual and meaningful goals. Partnerships tend to drive change by bringing in varied perspectives and encouraging curiosity.

University research partnerships also ensure exposure to diverse pools of knowledge, skills, expertise and perspectives for both students and faculty. Internationally collaborative publications tend to be of high quality and are cited significantly better than those from the individual contributing countries.

Exposure to different environments, datasets and contexts across the globe contributes to the researchers' development and results in outcomes with broader relevance.

Ashoka's research priorities across the Humanities, Social Sciences and Natural Sciences focus on challenges relevant across the globe – with its leading faculty, growing infrastructure and outstanding

students – positioning us as a compelling partner for the world's leading research universities and funding agencies. A robust meetings and workshops programme is also being developed. Along with prestigious domestic partnerships, these will feed into positioning Ashoka as an attractive place for confer

an attractive place for conferences and seminars and the best minds looking to engage with Ashoka.

We look forward to participation from and engagement across the Ashoka community to grow and deliver success driven by research alliances.

- K VijayRaghavan (Chair, Science Advisory Council) and Amrita Sadarangani (Senior Director and Head-Global Research Alliances)





SIMONS-ASHOKA FELLOWSHIP

The Simons-Ashoka Early Career Fellowship in Quantitative Biomedical Sciences, is a novel initiative launched by the Trivedi School of Biosciences, in collaboration with the Simons Foundation. This is the first-of-its-kind programme introduced by the Foundation outside the United States, and in a developing country.

This model aims to build an innovative research community using advanced Mathematical and Computational Methods to address key health issues, and incubate pioneering initiatives in personalised medicine. Fellows can work independently while being comentored by an Ashoka faculty and a globally reputed expert in their chosen research area, from either India or overseas.

The current cohort of Simons-Ashoka Early Career Fellows -

1. Dipendra Nath Basu (PhD, National Centre for Biological Sciences, Bengaluru)

- Focus areas: Health Research, Fundamental Biology
- Mentor: Imroze Khan, Associate Professor of Biology, Ashoka University
- Co-mentor: Jens Roff, Professor of Biology, Freie Universität Berlin





2. Mayank Garg (PhD, Institute of Genomics and Integrative Biology, New Delhi)

- Focus areas: Precision Medicine, Digital Healthcare
- Mentor: Gautam Menon, Professor of Physics and Biology, Ashoka University
- Co-mentor: Lalit Dandona, Distinguished Research Professor, Public Health Foundation of India and Professor of Health Metrics, University of Washington

3. Anubhav Prakash (Integrated PhD, National Centre for Biological Sciences, Bengaluru)

- Focus areas: Fundamental Biology and Clinical Research
- Mentor: Hiroshi Hamada, Distinguished Visiting Professor of Biology, Ashoka University
- Co-mentor: Sandeep Krishna, Professor, Simons Centre for the Study of Living Machines, NCBS, Bengaluru

4. Pratyush Pranav (PhD, University of Groningen)

- Focus areas: Astrophysics and Computational Biology
- Mentor: Anurag Agrawal, Dean of Biosciences and Health Research, Ashoka University
- Co-mentor: Armin Schwartzman, Halicioglu Data Science Institute, University of California San Diego







Carl Zeiss India

This partnership has been forged to establish a cutting-edge Core Imaging Facility at Ashoka. The state-of-the-art space, equipped with the latest microscopy technology from the ZEISS Group, will cater to researchers, students and collaborators in diverse fields such as Cell Biology, Soft Matter, Structural Biology and more.

As the first-of-its kind in India, this collaboration signifies ZEISS's inaugural venture with a private university in the country, showcasing a remarkable milestone in advancing scientific research.

SN Bose National Centre for Basic Sciences

The goal of this alliance is to foster collaboration and facilitate advancement of knowledge, in different disciplines within the Sciences. Some of the key focus areas identified include Technology, Astrophysics and Chemical and Biological Sciences.

Dr Dangs Lab

This partnership aims at creating comprehensive expertise in scientific, technological and clinical research, as well as health policy and public health programmes through high-quality research.

The end goal is to strengthen and accelerate the development of solutions against diseases that

are a global public health priority through joint research activities and academic interchanges.

I-Hub for Robotic and Autonomous Systems Innovation Foundation

The partnership aims at driving research and innovation projects in emerging areas including Artificial Intelligence, Bioinformatics, Genomics, Vaccine and Drug Discovery, Data Science, Computational Sciences, Disease Modelling, Epidemiology and other areas of mutual interest.

Centre for Chronic Disease Control

This MoU establishes a framework of collaboration for promoting and conducting research on health conditions across India via cost-effective screening of diseases and conditions that are affecting both individuals and society at large as well as the economy.

National Brain Research Centre

This alliance is towards establishing the 'Ashoka-NBRC Collaborative Platform' for initiating wide-ranging collaborations involving academic, research, product, process, human disease therapy development and beyond which will have a profound social and economic impact in our society and country.



INTERNATIONAL PARTNERS

Université Côte d'Azur, France -Franco-Indian Campus on Health for the Indo-Pacific Region

The partnership aims to advance education and research in Health Sciences, focusing on diseases like cancer, respiratory diseases and ageing, along with public health concerns such as antimicrobial resistance.

This collaborative effort involves Ashoka University, University of Cote d'Azur, Indian Institute of Science, Bengaluru, and Indraprastha Institute of Technology, Delhi. Through joint research projects, faculty exchanges and innovation initiatives, the alliance seeks to create impactful solutions at the intersection of health and Computer Science, fostering innovation and entrepreneurship.

University of Groningen, The Netherlands

This alliance will facilitate joint research endeavours and student exchange at both undergraduate and graduate levels, alongside fostering exchanges of faculty and researchers.

By actively participating in academic events and conferences, both institutions aspire to create a vibrant intellectual atmosphere conducive to collaborative work.

John Hopkins University, United States

The partnership seeks to enhance collaborative research and education in Health Sciences. Through joint programmes, workshops and student exchanges, the institutions aim to address key health challenges, including infectious diseases, mental health

and cancer. The partnership also includes funding opportunities to support innovative research projects and promote interdisciplinary collaborations for sustainable health solutions.

Linnaeus University, Sweden

This collaboration is with the Department of Cultural Sciences, Center for Concurrences in Colonial and Postcolonial Studies at Linnaeus University (LU). It brings together researchers from various disciplines such as Archaeology, Literature, History, Sociology, amongst others.

As part of this collaboration, two PhD scholars from Ashoka, Abhilasha Sawlani (English) and Aritri Chakrabarti (History), visited LU for a 10-week semester abroad in Spring 2023.

University of Geneva, Switzerland

Anurag Agrawal (Dean, Biosciences and Health Research) is working with the faculty of Medicine at the University of Geneva (UNIGE), towards hosting the Digital Transformation Health Lab (DTH-Lab) at UNIGE.

The lab will contribute to accelerating the development and implementation of innovative Science-based policy and decision-making in the domain of digital health.

Other notable partnerships signed during the year include -

- Amherst College, United States
- Cornell Global Hub, United States
- Monash University, Australia
- · Lingnan University, Hong Kong
- University of California, San Diego, United States
- University of Notre Dame, United States
- University of Toronto, Canada



YEAR AT A GLANCE

Since inception, Ashoka has been

a catalyst for in-depth research. The research community at Ashoka has published books and articles on a range of subjects.







FACULTY GRANTS

- Lalit Contractor's (Economics) research was sponsored by the Washington-based think tank, Center for Economic and Policy Research's Structural Transformation and Economic Growth initiative.
- Projit B Mukharji's (History) project was awarded the prestigious 2023 Guggenheim Fellowship, in the category of 'History of Science, Technology & Economics'.
- Anurag Agrawal's (Biology) research is supported by Pfizer Inc. Anurag was also awarded the prestigious JC Bose Fellowship. Additionally, his project titled 'Digital Transformations of Health Lab (DTH-Lab)', is being sponsored by the Foundation Botnar.
- Kumarjit Saha's (Mathematics) research is sponsored by the Indo-French Centre for the Promotion of Advanced Research.
- Hiroshi Hamada's (Biology) research is sponsored by RIKEN, Japan's largest national research and development agency.
- Poornima Prabhakaran's (Trivedi School of Biosciences) research is sponsored by DBT/Wellcome Trust India Alliance, Karolinska Institute/FORMAS and the University of Edinburgh.
- Srijita Ghosh's (Economics) project is sponsored by the Suzanne and Hans Biäsch Foundation.
- Meghna Agarwala's (Environmental Studies) research project is supported by The Swedish University of Agricultural Sciences/Swedish Research Council.
- Amita Baviskar's (Environmental Studies and Sociology and Anthropology) research is funded by the University of Cambridge.
- Debayan Gupta's (Computer Sciences) current research is supported by the Mozilla Foundation.
- Anisha Sharma's (Economics) project is being funded by IZA - Institute of Labor Economics, Germany.
- Twelve other research projects from Biology, Chemistry, Physics and Psychology are being sponsored by DST-SERB.
- Ashoka received the single largest donation ever from the Harish and Bina Shah Foundation, focused on driving teaching and research excellence in the Humanities. The grant will support interdisciplinary research initiatives in the Social Sciences and Humanities.
- Ashoka announced the launch of the first cofunded Breakthrough Research Grant with the Gupta-Klinsky India Institute at Johns Hopkins University. Debayan Gupta (Computer Science) and Rintu Kutum (Computer Science) emerged as the first round winners, along with two principal investigators from the Johns Hopkins School of Medicine.

FACULTY ACHIEVEMENTS

- Somak Ray Chaudhury (Vice-Chancellor | Physics) -Awarded the JV Narlikar Lifetime Achievement Honor for his contributions to the fields of Cosmology and Astrophysics
- Gautam Menon (Physics and Biology) Appointed as commissioner on the Lancet Commission for a project titled 'Strengthening the use of epidemiological modelling of emerging and pandemic infectious diseases' | Member of WHO's Technical Advisory Group on Embedding Ethics in Health and Climate Change
- Sumana Roy (English and Creative Writing) Awarded the Omega Resilience Awards Fellowship for her contributions to the field of Plant Humanities
- Sourav Pal (Chemistry) Appointed as the Chairperson of the Chemical Council at the Bureau of Indian Standards
- Ashwini Deshpande (Economics) Awarded the 2023 International Economics Association Fellow Award
- Maya Mirchandani (Media Studies) Awarded the prestigious New India Foundation Book Fellowship

PUBLICATIONS

Books

- A New History of India: From Its Origins to the Twenty-first Century, co-authored by Rudrangshu Mukherjee (History)
- The Best of Tagore, edited and introduced by Rudrangshu Mukheriee
- Searching for Ashoka Questing for a Buddhist King from India to Thailand by Nayanjot Lahiri (History)
- Sovereigns of the Sea: Omani Ambition in the Age of Empire by Seema Alavi (History)
- Climate Change and Critical Agrarian Studies, co-edited by Amita Baviskar (Environmental Studies and Sociology and Anthropology)
- Nund Rishi: Poetry and Politics in Medieval Kashmir by Abir Bazaz (English)

Book Chapters

- 'Health informatics and data science for pandemic preparedness' in Genomic Surveillance and Pandemic Preparedness by Anurag Agrawal (Biology)
- 'Components of density functional reactivity theory-based stabilization energy: descriptors for thermodynamic and kinetic reactivity' in Chemical Reactivity: Volume 2: Approaches and Applications by Sourav Pal (Chemistry)
- 'Past Continuous: Munshi, Gujarat, and the Patan Trilogy' in Indian Modernities: Literary Cultures from the 18th to the 20th Century by Rita Kothari (English)
- 'India: Employment and inequality trends' in Tasks, Skills, and Institutions: The Changing Nature of Work and Inequality by Kanika Mahajan (Economics)
- 'Buddhism, Animal Ethics and Environmentalism' in Capital and Ecology: Developmentalism, Subjectivity and the Alternative Life-Worlds by Swargajyoti Gohain (Sociology and Anthropology)
- 'Homeland, cows and climate change: The visualisation of environmental issues by the far right in India' in Visualising far-right environments: Communication and the politics of nature by Mukul Sharma (Environmental Studies)

 'Climate change and river waters in South Asia: Scarcity, security and the avoidance of zero-sum approaches he anthropocene epoch' in The

in the anthropocene epoch' in *The* Routledge Handbook of South Asia: Region, Security and Connectivity by Ananya Sharma (International Relations)

Research Papers

- Avantika Bhatia (Economics) published a research article titled 'The Relationship Between Parental Attachment and Career Aspirations in Indian Female Undergraduate Students' in the Journal of Career Assessment
- Subhasree Chakravarty (English) published a paper titled "'Please Don't Go Yet': The Voice and Texture of Indian Women's Campaign Rhetoric" in Feminist Encounters.
- Vrinda Chopra (Centre for Writing and Communication) published 'Actually Existing Neoliberalism and Enterprise Formation in the Informal Economy: Interrogating the Role of Mediating Social Enterprises in India and South Africa' in Economic Geography
- Anurag Agrawal (Biology) published a correspondence article titled 'Laying an equitable data foundation for foundation models' in The Lancet Regional Health - Southeast Asia
- Pavan Mamidi (Centre for Social and Behaviour Change) published 'Insights from a qualitative study of the procurement and manufacture of active pharmaceutical ingredients in India' in BMJ Global Health
- Kritika Garg (Biology and Centre for Interdisciplinary Archeological Research) and Balaji Chattopadhyay (Biology) published a paper titled 'Next Generation Sequencing Revolutionizes Organismal Biology Research in Bats' in Journal of Molecular Evolution
- Sourav Pal (Chemistry) published a paper titled 'Unraveling the origin of the cooperative adsorption of carbon monoxide in an Fe(II) metalorganic framework' in *Chemical* Communications

- Amita Baviskar (Environmental Studies and Sociology and Anthropology) published an insightful article titled 'Decolonizing a discipline in distress: Anthropology's pasts, present, and futures in India' in American Ethnologist
- Krishna Melnattur (Psychology and Biology) published an interesting paper titled 'Comparative biology of sleep in diverse animals' in The Journal of experimental biology
- Bastian Steuwer (Political Science) published a paper titled 'Ethical and legal race-responsive vaccine allocation' in *Bioethics*
- Vidya Avasare (Chemistry) published a research paper titled 'Assessment of the Catalytic Performance of a Heterogeneous Fe2C Catalyst in the Formation of Multicarbon Products from Carbon Dioxide' in ACS Applied Materials and Interfaces
- Anurag Agrawal (Biology) published 'Making digital transformations work for health: introducing a new consortium to take forward recommendations from the Lancet and Financial Times Commission' in The Lancet
- Deepak Asthana (Chemistry)
 published a paper titled 'A
 supramolecular assembly-based
 strategy towards the generation
 and amplification of photon up conversion and circularly polarized
 luminescence' in Nanoscale
- Ashwini Despande (Economics) published a paper titled 'Norms that matter: Exploring the distribution of women's work between income generation, expenditure-saving and unpaid domestic responsibilities in India' in World Development
- Naresh Keerthi (Sanskrit Studies) published a paper titled 'Kawisamaya: Towards an Ecocritical Theory of Kakawin literature' in Philological Encounters
- Lipika Dey (Computer Science) published a review article titled 'Knowledge graph-driven data processing for business intelligence' in Wiley International Review: Data Mining and Knowledge Discovery
- Debayan Gupta (Computer Science) published a paper titled 'Seasonal variations in social contact patterns in a rural population in north India: Implications for pandemic control' in PLOS One

STUDENT ACHIEVEMENTS

- Biswajit Shit (Biology) became the first Indian student to be awarded the American Society of Naturalists (ASN) Student Research Award 2024. The grant will support Biswajit's research by funding critical components such as laboratory tools and materials
- Kaushik Narayanan (Environmental Studies) was awarded a personal research grant from Idea Wild, a US-based organisation. He was also selected for the prestigious Inlaks Ravi Sankaran Programme Internship in 2023, which supported his visit to National University of
- Abhishek Singh (Biology and Psychology) received the INTPART-SQuID Travel Fellowship, sponsored by the Government of Norway. As a part of the Fellowship, he visited a lab at the Ludwig Maximilian University of Munich, Germany
- Sandeep Bhardwaj (History) published a single author paper titled 'Three meanings of colonialism: Nehru, Sukarno, and Kotelawala debate the future of the Third World Movement (1954-61)' in the Journal of Global History
- Riya Mehta (Physics) has been awarded a travel grant by the Institute of Electrical and Electronics Engineers (IEEE) to attend the IEEE Magnetic Society Summer School at Chientan Youth Activity Center, Taiwan
- Bharath M (Chemistry) was awarded the CSIR-Direct Senior Research Fellowship position
- Debodyuti Mondal (Biology) received a travel grant to attend the Mechanobiology in Health and Disease conference, organised at the National University of Singapore
- Akansha Singh (History) and Nabajyoti Ghosh (History) were awarded the Charles Wallace Fellowship to conduct archival research in libraries and archives in the UK
- Chandrakanth M (Biology) was awarded the European Society Evolutionary Biology (ESEB) Conference Travel Award 2024. He intends to utilise the travel stipend to attend and present a portion of his research at the 29th European Meeting for PhD Students in Evolutionary Biology in Austria

MEETINGS

- The 6th National Post-Doctoral Symposium (NPDS), was held at the Trivedi School of Biosciences, in collaboration with the National Centre for Biological Sciences and the Institute for Stem Cell Science and Regenerative Medicine.
- A first-of-its-kind international conference on 'River Islands: Redefining the Anthropocene' was organised at Ashoka, in collaboration with IIT Kharagpur and the Indian Council of Social Science Research.
- The Twenty-Sixth International Workshop on Quantum Systems in Chemistry, Physics and Biology (QSCP-XXVI) was hosted in India for the first time, in 2023. This was organised by Ashoka, in association with the University of Hyderabad, IISER Kolkata, the Indian Association for the Cultivation of Science and the University of Rajasthan.
- Ashoka hosted Professor Patrick Olivelle (University of Texas) for the third lecture of the Inspire Lecture Series. He spoke on the topic - 'Ashoka's Journey: From Devotee of Buddhism to Apostle of Ecumenism'.
- The Research and Development Office organised a series of lectures on the Nobel Laureates of 2023 from the fields of Physiology and Medicine, Physics, Chemistry and Economics.





NOTE **FROM** THE

DEAN OF RESEARCH

As Ashoka University completes 10 years of its journey, we look to the future with anticipation.

Ashoka occupies a unique position as India's best-known Liberal Arts, Sciences and research university. Innovative teaching and courses apart, our integration of the research we do into the classroom makes the Ashoka experience special. The steadily increasing numbers of PhD students, post-doctoral fellows and research staff at Ashoka attest to its rising visibility on the research stage. Over the next decade, these numbers will expand considerably, as will the impact of Ashoka's research.

Ashoka now hosts the world's oldest and best-known journal of the History of Science. The Ashoka Archives of Contemporary India contain the papers of many of India's creators and intellectual giants, a trove for current and future historians. The Trivedi School of Biosciences innovates in the Biology and Ecology of health and disease, while several of its related centres are situated at the intersection of genomics, nutrition, big data and personalised medicine. Ashoka's Economics department is broad-based but is especially well-known in the fields of gender and development economics. Harish and Bina Shah Foundation endowment for the Humanities is the single largest endowment in this area across any Indian institution and will spur research at Ashoka.

This past year saw the first book written entirely by an Ashoka student, a field-

guide to the flora of Uttarakhand. Books and papers written by Ashoka faculty have attracted attention worldwide and received important prizes. Ashoka's

The world should think of Ashoka as a place where ideas can flourish unconstrained

centres act as interdisciplinary points of intersection for diverse departments, with many of them providing independent and credible advice to policy makers from an academic perspective. Ashoka hosts an increasing number of meetings each year, which bring academics of world-wide renown to our campus, providing special opportunities for Ashoka's unique vision to be showcased.

In this, just our tenth year as an institution, we can be proud of where we've reached, against many odds. But we cannot afford to be content with this. For the future. we should measure Ashoka's impact in terms of how we can set agendas, with a uniquely Indian flavour, for novel and impactful research across the Humanities, Social Sciences, Mathematics and the Sciences. The world should think of Ashoka as a place where ideas can flourish unconstrained, where our connection to the society we live in is constantly present. where our concern for our environment manifests itself in all we do, and where research and teaching are not separate and disconnected but an organic whole.

GAUTAM MENON





