

Interdisciplinary Knowledge Series

**Interdisciplinary Insights:
Advances in Basic and Bio Sciences
in Digital & ICT Age**

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**Interdisciplinary Insights:
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- Edited by -

**P. K. Paul
D. Bhadra
S. Sarkar
S. Pal**



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Preface

Interdisciplinary collaboration unlocks new dimensions of understanding, where the fusion of basic and biological sciences with digital and ICT innovations creates a symphony of progress, transforming both knowledge and its application in our rapidly evolving world. In the rapidly evolving landscape of the 21st century, the convergence of diverse fields of study has never been more critical. As we stand on the precipice of unprecedented technological advancement, the need to bridge the gap between traditional disciplines and emerging digital technologies becomes increasingly evident. It is within this dynamic context that we present “Interdisciplinary Insights: Advances in Basic and Bio Sciences in the Digital & ICT Age.”

This volume is the culmination of collective efforts from a distinguished panel of experts who have meticulously curated content to illuminate the transformative impact of digital and Information and Communication Technology (ICT) advancements on the basic and biological sciences. These chapters are the result of, and overlap with, the papers presented at the International Conference *ICMRM 23*, held on October 12-13 at *Bhairab Ganguly College, Belgharia, Kolkata-700056, West Bengal, India*. Our goal has been to foster a deeper understanding of how interdisciplinary approaches can drive innovation and address the complex challenges faced by contemporary science.

The book is structured to provide a comprehensive overview of the significant strides made in various scientific fields due to the integration of digital tools and ICT. Each chapter is designed to showcase the pivotal role that technology plays in advancing research, enhancing data analysis, and facilitating new methodologies. From groundbreaking computational models to sophisticated bioinformatics tools, the contributions in this volume reflect the richness and depth of interdisciplinary research.

We have sought to include a diverse range of perspectives, from theoretical explorations to practical applications, ensuring that readers gain a holistic view of the current state and future potential of science in the digital age. The chapters are authored by leading scholars and practitioners who have generously shared their insights and findings, making this volume an invaluable resource for researchers, students, and professionals alike.

As editors, we extend our heartfelt gratitude to all contributors for their dedication and to our readers for their interest in this evolving field. It is our hope that “Interdisciplinary Insights” will not only serve as a cornerstone for future research but also inspire continued collaboration across disciplines, driving forward the boundaries of scientific discovery and technological innovation.

Welcome to a journey through the forefront of science in the digital era.

Editors

Dr. P. K. Paul

Dr. D. Bhadra

Mr. S. Sarkar

Dr. S. Pal

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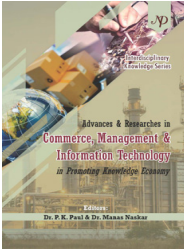
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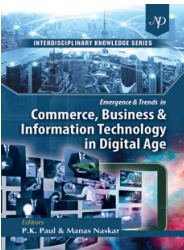
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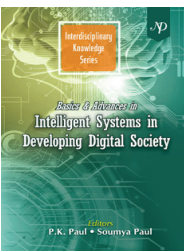
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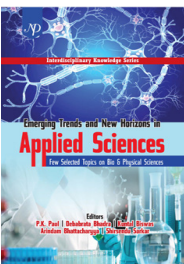
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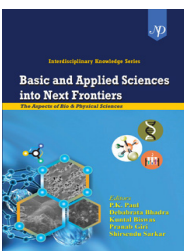
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P. K. Paul, Debabrata Bhadra, Kuntal Biswas, Pranab Giri and Shirsendu Sarkar

About the Book Editors



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Dr. P. K. Paul holds prestigious and unique D.Sc. in Information Science and Technology (IST) degree from Azteca University, Mexico under Dr. Agustin Yoh International Postdoctoral Fellowship (DAYIPF) Program. He also holds Ph.D. in IST from IEST Shibpur, Post-Doctoral Fellow Certificate (PDFC) Program in Environmental Informatics. He has to his credit unique and research based degrees viz. M.Tech. (by Research), MS (by Research) in addition to M.Sc. (Double). He is currently working as Asst. Professor (IST) & Executive Director (MCIS Program), at Dept. of Computer & Information Sciences, and additionally Information Scientist (Offg.) Position at Raiganj University, West Bengal, India. He is Chief Editor of IJASE, New Delhi, India and Chief Editor, IRA International Journal of Management and Social Sciences, Chief Editor of IJISC, New Delhi, India. Dr. Paul holds 250+ Authored Indexed, Refereed Papers, Articles, and 100+ Book Chapters to his credit and about 30 National and International Authored and Edited Books. He is also involved as Editorial Board Member of more than 130 National and International Journals in diverse fields. He has completed many Invited Talk viz. SRM University, Sikkim University, VIT University, Srinivas University, Mangalore University, TCG Digital, CloudNet India. He has the track record of associating more than 200 International Conferences as TPC, Advisory Committee, Speakers and in Organizing Body. Dr. Paul has delivered several invited talks in leading and reputed academic and industrial establishments like SRM University, Sikkim University, VIT University, Srinivas University, Mangalore University, Assam Central University, Chaitanya Deemed to be University, TCG Digital, and CloudNet India. He has received many Awards such as Best Researcher Award in Information Sciences (from IARA, Trichy), David Clark Blair Young Scientist

Award in Computer & Information Science (from BSS, India), International Young Scientist Award (from ISROSET) for the contribution in Health Informatics, Citation Award (from SSCET/Sri Sai University), International Social Science and Digital Society Think Tank Award-2020, International Outstanding Research & Scientific Events Organizer-2021, Dr. Agustin Yoh International Postdoctoral Fellow Award and Fellow of Azteca University (FAU) in 2021, etc.



Dr. Debabrata Bhadra, M.Sc., Ph.D.

Associate Professor,

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Dr. D. Bhadra is a distinguished scholar with a solid academic background, having earned his B.Sc and M.Sc in Physics from Jadavpur University. He further advanced his education by completing a Ph.D. at the University of Calcutta, conducting research at the Department of Solid State Physics, Indian Association for the Cultivation of Science. His research journey reflects a commitment to excellence, with a focus on Polymer Nanocomposites, Nanomaterials, Biopolymers, Tissue Engineering, Dielectric and Ferroelectric materials, and membrane applications. Dr. D. Bhadra's extensive experience includes adept handling of diverse research equipment and proficiency in interfacing with various software systems. With an impressive track record of over 15 years in research, Dr. D. Bhadra has emerged as an expert in reviewing articles for international peer-reviewed high-impact research journals. His scholarly impact is evident through an impressive h-index of 11, supported by more than 400 citations. Dr. D. Bhadra has also actively participated in numerous national and international conferences, presenting papers that contribute to the scientific discourse. Beyond his individual achievements, Dr. D. Bhadra is dedicated to nurturing the next generation of researchers. He has successfully supervised 9 M.Sc. project dissertations, showcasing his mentorship skills. Currently, he is actively guiding 2 research scholars, further demonstrating his commitment to advancing knowledge and fostering academic growth.

Dr. D. Bhadra, a distinguished professional, garnered the Certificate of Achievement from The PROGRESS Global Awards 2020, acknowledging outstanding research prowess on November 7, 2020. Having received the Best e-poster award at the National Conference on Recent Developments in Nanoscience & Nanotechnology, held at Jadavpur University, Kolkata, from January 29 to 31, 2019, Dr. D. Bhadra showcased expertise in the field. Adding to the accolades, Dr. Bhadra was honored with the prestigious Bharat Ratna Mother Teresa Gold Medal by the Global Economic Progress & Research Association, New Delhi, on December 22, 2018.

This recognition was a testament to significant contributions to national economic growth through individual efforts. Further attesting to their achievements, Dr. D. Bhadra earned a Certificate of Commendation at the 24th State Science and Technology Congress-2017. This event, organized by the Department of Higher Education, Science & Technology & Biotechnology, Govt. of West Bengal, took place in Kolkata from February 28 to March 1, 2017.

Beyond their research, Dr. D. Bhadra actively contributes as a reviewer for esteemed journals such as Material Science and Engineering B, Physica B, Journal of Applied Polymer Science, Indian Journal of Pure and Applied Physics, Applied Physics A, and Materials Letters.

Dr. D. Bhadra is not only recognized in the academic sphere but is also a respected member of various esteemed bodies and societies, including the Indian Association for the Cultivation of Science, Indian Physical Society, Indian Statistical Institute, Indian Science Congress, and the Indian Cryogenics Council.



Shri. Shirsendu Sarkar, M.Sc.
Assistant Professor & HOD
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Shri. Shirsendu Sarkar has obtained his M.Sc degree in Physics from Indian Institute of Technology Madras in the year of 2011. Currently, He is working as Assistant Professor in the Dept. of Physics in Bhairab Ganguly College (NAAC Accredited Grade ‘A+’ College) and continuing his research work in West Bengal State University, Barasat, India. He has been associated with the Department of Applied Optics and Photonics, University of Calcutta and Dept. of Oncology, Medical College, Kolkata for Bio-Medical research purposes. He is life member of Indian Physical Society, Optical Society Of India (OSI), SPIE (The International Society for Optics and Photonics), Optical Society of America (OSA). He knows very well of handling different optical instruments and interfacing different softwares. His interests of research are Bio-medical Optics, Laser, Optics, Photonics, Adaptive optics, Nonlinear optics. He has been appreciated by Optical Society of India to the contribution towards the compendium of International year of light (IYL) activities in India, 2015.



Dr. Subharthi Pal, Ph.D.
Assistant Professor & In-Charge of Zoology
Bhairab Ganguly College,
Belgharia, Kolkata-56

Dr. Subharthi Pal is currently serving as an Assistant Professor and In – Charge of the Department of Zoology and additionally as In – Charge of the Department of Environmental Studies, Bhairab Ganguly College, affiliated to the West Bengal State University. He is originally from Berhampore, Murshidabad, West Bengal. He completed his bachelors (Ranked 1st Class 3rd) from Presidency College, Kolkata and later completed his Masters (Ranked 1st class 4th) from the University of Calcutta. He earned his Ph.D. in Fish Immunology from the Aquatic Bio-resource Research Laboratory, Ballygunge Science College under the able guidance of Prof. Sumit Homechaudhuri in 2018. He has more than 16 publications in different national and international journals and 3 book chapters to his credit till date. He was awarded the Young Scientist Award in the International Research Awards on Science, Technology and Management, held on 14 & 15 May 2022, Chennai, India, organized by VDGGOOD Professional Association, India. He was also awarded the Young Faculty Award 2023 by the International Benevolent Research Foundation, Kolkata at the Higher Education and Research Summit, held on 05 October, 2023. He has attended and presented his research work in more than 50 seminars, conferences, and workshops both at the national and international level. His current research interest includes understanding the cellular and molecular aspects of nonspecific and specific immunity in various fish models against viral and microbial pathogens; Immunomodulation in fish by usage of pro-biotics and other phytochemicals and/or immunostimulants; application of Phage Therapy as alternate disease control measure in aquaculture etc. He has life memberships in various scientific bodies like the Indian Science Congress Association, India; the Zoological Society, Kolkata etc.

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