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Transdisciplinary Science: Mapping the Future of Research

Collaborative Research for Complex Global Challenges

Volume 1

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Transdisciplinary Science: Mapping the Future of Research

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Preface

The very fabric of our world is woven from interconnected challenges and complexities that defy the boundaries of single academic disciplines. From climate change and sustainable energy to public health and social equity, the most pressing issues of our time demand a new approach, one that is collaborative, innovative, and above all, transdisciplinary. It is this fundamental belief that inspired the creation of this book, Transdisciplinary Science: Mapping the Future of Research.

This volume is a testament to the power of breaking down traditional siloed approaches to research and embracing a holistic perspective. It is the culmination of a shared journey undertaken by a diverse group of researchers and scholars who have contributed their expertise across a remarkable spectrum of fields. The chapters within these pages explore a vast landscape, from the intricacies of photovoltaic cells and material sciences to the sociological dynamics of economic empowerment and the ethical dimensions of scientific research. We delve into cutting-edge topics such as machine learning in drug design, the role of biochar in environmental remediation, and even the astrophysical conditions of the low-redshift universe. This intellectual breadth is not merely a collection of disparate topics; it is a deliberate mosaic designed to illustrate how different disciplines can inform and enrich one another, creating a more complete picture than any single field could achieve alone.

Our journey in bringing this book to fruition has been a truly collaborative one. We extend our deepest gratitude to all the contributing authors, whose dedication and rigorous scholarship have shaped this work. Their commitment to exploring new frontiers and sharing their findings is the cornerstone of this publication. We also wish to express our sincere appreciation to our esteemed peer reviewers, whose meticulous feedback and insightful critiques were essential in maintaining the high standard of academic excellence that defines this book. Their efforts ensured the integrity and quality of every chapter.

We hope that this book will serve as a catalyst for new conversations and collaborations, inspiring readers to break down their own disciplinary barriers. We envision these pages as a guide to new pathways, paving the way for a future where research is truly without borders and where we can face our collective challenges with a shared, integrated vision.

Dr Mukul Kumar Baruah, Dr Rahul Kanti Nath and Dr Joyobrato Nath *Editors*

About the Editors

Dr Mukul Kumar Baruah, Associate Professor and Head of the Department of Botany at Cachar College, Silchar, is a distinguished scholar specialized in Angiosperm Taxonomy with research interests in floristics and ethnobotany. He earned his M.Sc. from Gauhati University and Ph.D. from Assam University, Silchar, and brings over 25 years of teaching experience. Beyond teaching, he has held key administrative positions, including Coordinator of the IQAC and multiple terms as Head of Department. As Principal Investigator, he has successfully completed projects funded by UGC-MRP, ASTEC, and the Ministry of Education under the Unnat Bharat Abhiyan. Author of two books and numerous research papers and chapters, Dr. Baruah is also active in academic community building through organizing seminars, conferences, and extensive institutional engagements across India.

Dr Rahul Kanti Nath is an accomplished academic and researcher in Chemistry, presently serving as Assistant Professor in the Department of Chemistry at Cachar College, Silchar, since May 2017. He earned both his M.Sc. (2004) and Ph.D. (2011) in Chemistry from Assam University, Silchar, where he also worked as a DST-JRF in a DST-sponsored project during his doctoral research. With a strong research interest in molecular design and materials chemistry, he has published widely in reputed international journals and contributed chapters to edited books. As an educator, Dr. Nath combines scholarly rigor with a passion for advancing chemical sciences through teaching, research, and academic collaboration.

Dr Joyobrato Nath is currently working as an Assistant Professor in the Department of Zoology at Cachar College, Silchar, Assam, India. He holds an MSc in Life Science and a PhD in Biotechnology from Assam University. He began his research journey as a DBT-JRF and DBT-SRF in a DBT Twinning Project between the Molecular Parasitology Laboratory, G. C. University, Silchar and JNU, New Delhi. With over a decade of teaching and research experience, his contributions to the scientific community are exemplified by the publication of more than 20 research articles/books/ book chapters in the domains of Molecular Biology and Medical Biotechnology. His work has been published in prestigious publishing houses, like Cambridge University Press, Elsevier, Springer, PLOS, etc.

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Transdisciplinary Science:
Mapping the Future of Research

The book "Transdisciplinary Science: Mapping the Future of Research" explores how merging disciplines enables creative solutions to complex global challenges. It highlights the evolving landscape of research, emphasizing the necessity of crossing traditional academic boundaries for innovation. The authors discuss frameworks for integrating sciences, humanities, and societal needs, advocating for collaboration as essential for future progress. The book ultimately serves as a guide for researchers, educators, and policymakers committed to advancing holistic, future-oriented scientific inquiry.

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