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3.2.1 - Number of papers published per teacher in the Journals notified on UGC website during the year

Title of paper	Name of the author/s	Department of the teacher	Name of journal	Year of publication	ISSN number
Sythesis of ruthenium(ii) complexes with carboxamide derivatives: spectroscopic characterisation and studies on dna and bsa interaction	**Hena Paul,** Rajesh Chakraborty, Pabitra Chattopadhyay	CHEMISTRY	Rasayan Journal of Chemistry	2021	0974-1496
Relaxation oscillation and canard explosion in a slow–fast predator–prey model with Beddington–DeAngelis functional response	T. Saha, **P. J. Pal,** M. Banerjee	MATHEMATICS	Nonlinear Dynamics, Volume 103	2021	Print ISSN 0924-090X, 1573-269X
Bioaccumulation pattern of heavy metals in fsh tissues and associated health hazards in human population	**Mukherjee, J.,** Saha, N. C., Karan, S	ZOOLOGY	Environmental Science and Pollution Research	2021	1614-7499
Spatial heterogeneity within habitat indicates the community assemblage pattern and life strategies	Moniruzzaman, M., Bhowmick, A. R., Karan, S., & **Mukherjee, J**	ZOOLOGY	Ecological Indicators	2021	1470-160X
Immunotoxic role of organophosphates: An unseen risk escalating SARS-CoV-2 pathogenicity	Rajak, P., Ganguly, A., Sarkar, S., Mandi, M., Dutta, M., Podder, S., **Khatun, S.,** Roy, S	ZOOLOGY	Food and Chemical Toxicology	2021	0278-6915
In Silico Study Reveals Binding Potential of Rotenone At Multiple Sites of Pulmonary Surfactant Proteins: A Matter of Concern	Rajak, P., Roy, S., Pal, A. K., Pramanik M., M., Dutta., Podder, S., Sarkar, S., Ganguly, A., Mandi, M., Dutta, A., Das, k., Ghanty, S., **Khatun, S.**	ZOOLOGY	Current Research in Toxicology	2021	2666-027X

Title of paper	Name of the author/s	Department of the teacher	Name of journal	Year of publication	ISSN number
Understanding the cross-talk between mediators of infertility and COVID-19	Rajak, P., Roy, S., Dutta, M., Podder, S., Sarkar, S., Ganguly, A., Mandi, M., Khatun**, S**	ZOOLOGY	Reproductive Biology	2021	1642-431X
Urban Agglomerations and Changing Landuse Patterns in Murshidabad district, West Bengal, India	Sanjay Mandal	GEOGRAPHY	Indian Journal of Spatial Science	2021	ISSN: 2249 - 3921, EISSN: 2249 - 4316
Fabrication and Characterization of Back-to-Back Schottky Diode in Ni/ZnO/Ag Nanojunction	**Rini Labar** · Tapas Kumar Kundu	PHYSICS	Journal of Electronic Materials	2021	0361-5235
Cytotoxicity of Natural Flavones and Flavonols Against Different Cancer Cells.	Arindam Gangopadhyay, Syamantak Chakraborty **Shyamal K. Jash** and Dilip Gorai	CHEMISTRY	Journal of the Iranian Chemical Society	2022	1735207X, 17352428
Neel Bidroho:Ekti Bastunishtha Samiksha	Pinaki Dey	HISTORY	Tabu Ekalabya	2022	0976-9463
GLOBALIZATION:WHY INDIA RESORTED TO GLOBALIZATION	Rintu Kr. Biswas	POLITICAL SCIENCE	Insight: An International Journal of Humanities & Management	2022	2394-7462
MAHAMARI O KABITA	Tapan Goswami	BENGALI	AVIMUKH	2022	2349-4107
Online Shopping Behaviour of People in Emerging Cities of India: A Case Study for West Bengal	**Shyamal Garai*** and Tarit Kanti Sen**	COMMERCE	MANTHAN: Journal of Commerce and Management	2022	ISSN: 2347-4440 e-ISSN: 2395-2601
An efficient interpolating wavelet collocation scheme for quasi-exactly solvable Sturm–Liouville problems in R^+	*Debabrata Singh,* ***M. K. Saha,*** *Sayan Banik, Madan Mohan Panja*	PHYSICS	Mathematical Methods in the Applied Sciences	2022	0170-4214

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SYTHESIS OF RUTHENIUM(II) COMPLEXES WITH CARBOXAMIDE DERIVATIVES: SPECTROSCOPIC CHARACTERISATION AND STUDIES ON DNA AND BSA INTERACTION

Hena Paul[1], ✉, Rajesh Chakraborty[2] and Pabitra Chattopadhyay[2]

[1]Department of Chemistry, Hetampur Krishna Chandra College, Hetampur, Birbhum,731124, West Bengal, India

[2]Department of Chemistry, The University of Burdwan, Golapbag, Burdwan, 713104, West Bengal, India.

✉Corresponding Author: hena_paul84@rediffmail.com

ABSTRACT

Two new mononuclear ruthenium(II) complexes of two new carboxamide derivatives formulated as $[Ru(bpy)2(L^7)](ClO_4)_2$ (**1**) and $[Ru(bpy)2(L^8)](ClO_4)_2$ have been isolated as pure materials from the reaction of HL^7 and HL^8 [where HL^7= *N*-(furan-2-ylmethyl)-2 pyridinecarboxamide and HL^8 = *N*-(thiophen-2-ylmethyl)-2-pyridinecarboxamide] with $Ru(bpy)_2Cl_2$. All the complexes were characterized by physico-chemical and spectroscopic tools. The interaction of the complexes with calf thymus DNA (CT-DNA) using absorption, emission spectral and viscosity studies have been used to determine the binding constant, K_b and the linear Stern-Volmer quenching constant, K_{SV}. The results indicate that the ruthenium(II) complexes interact with CT-DNA strongly in a groove binding mode. The interactions of bovine serum albumin (BSA) with the complexes were also investigated with the help of absorption spectroscopy tools. Absorption spectroscopy proved the formation of a ground state BSA-$[Ru(L)(bpy)_2](ClO_4)_2$ complex.

Keywords: Ruthenium Complex, Carboxamide Derivative, BSA, CT- DNA.

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INTRODUCTION

Coordination chemistry of metal complexes derived from the ligands containing carboxamide (-CONH-) nitrogen donors has received considerable current attention.[1-7] Especially the last few decades have witnessed a remarkable interest in pyridine–N containing carboxamide complexes in various fields of biological relevance like asymmetric catalysis,[8,9] dendrimer preparation,[10] molecular receptor synthesis[11] and also in the synthesis of compounds with possible anti-tumor properties.[12-16] Carboxamide [–C(O)NH–], a key moiety of the primary structure of proteins, represents an important ligand in coordination chemistry, since its chelating rigid nature imparts a unique balance of stability versus reactivity, and allows for developments in catalytic transformations. There are several roles exhibited by carboxamide nitrogen in the chemistry of different coordination complexes. For example, cobalt and iron centers present in the enzyme nitrile hydratase (NHase) are bound through carboxamido nitrogen atoms [17-19]. This amido nitrogen possessing trans effect is also found to be important for the coordination and photolability of nitric oxide (NO).[20-23] Collins and coworkers[5,6] have extensively studied the coordination chemistry of metal complexes derived from the macrocyclic ligands containing four carboxamido nitrogen donor centers.

Among the transition metals, the chemistry of ruthenium is currently receiving a lot of attention, primarily because of the fascinating electron transfer, photochemical and catalytic properties displayed by the complexes of this metal[24]. Ruthenium complexes containing heterocyclic nitrogenous ligands use as building blocks for supramolecular assemblies, photophysical properties, directional electron and energy transfer, DNA intercalation, and potential antitumor activity.[25-28] A wide range of ruthenium compounds have been used in the synthesis of potential anticancer drugs.[29-31] Because of the spectroscopic and redox

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ORIGINAL PAPER

Relaxation oscillation and canard explosion in a slow–fast predator–prey model with Beddington–DeAngelis functional response

Tapan Saha · Pallav Jyoti Pal · Malay Banerjee

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Abstract In this paper, we consider a predator–prey model with Beddington–DeAngelis functional response. Considering the predator's rate of growth and death is much lower than that of prey's, the model becomes a slow–fast system that mathematically leads to a singular perturbation problem. Using geometric singular perturbation theory due to Fenichel and blow up technique, we have investigated the system and obtained very rich and complicated dynamical phenomena including the existence of relaxation oscillation, canard cycles near the Hopf bifurcation point and the interesting phenomenon of canard explosion.

Keywords Slow–fast · Canard cycles · Canard explosion · Relaxation oscillation

T. Saha
Department of Mathematics, Presidency University, Kolkata 700073, India
e-mail: tapan.maths@presiuniv.ac.in

P. J. Pal
Department of Mathematics, Krishna Chandra College, Hetampur, Birbhum 731124, India
e-mail: pallav.pjp@gmail.com

M. Banerjee (✉)
Department of Mathematics and Statistics, Indian Institute of Technology Kanpur, Kanpur, Uttar Pradesh 208016, India
e-mail: malayb@iitk.ac.in

1 Introduction

In most natural and human-mediated systems, such as physical [60], chemical [12,44,48], pharmacological [37], neuro–biological [38] and ecological [30] systems, different system variables evolve on two or more different time scales and a detailed understanding of such system evokes several complex phenomena. From a mathematical point of view, one of the straightforward approach to handle the systems involving multiple time scales, as found in the literature, is to get started with a singularly perturbed ordinary differential equations with just two distinct time scales, given by

$$\dot{x} = f(x, y, \mu, \epsilon), \tag{1a}$$
$$\dot{y} = \epsilon g(x, y, \mu, \epsilon), \tag{1b}$$

where $x \in \mathbb{R}^m$ and $y \in \mathbb{R}^n$ denote the fast and the slow variables, respectively, $\mu \in \mathbb{R}^k$ are parameters, $m, n, k \geq 1$ in general, f and g are the sufficiently smooth functions, $0 < \epsilon \ll 1$ is the singular perturbation parameter that indicates system separation into slow and fast time scales, and the over dot $(\dot{})$ denotes differentiation with respect to the fast time $t \in \mathbb{R}$. The model (1) is the simplest model among the available models having multiple time scales. Equation (1) can be rescaled as an alternative way by switching the fast time to the slow time by $\tau = \epsilon t$ given by

$$\epsilon x' = f(x, y, \mu), \tag{2a}$$

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Understanding the cross-talk between mediators of infertility and COVID-19

Prem Rajak[a,*], Sumedha Roy[b], Moumita Dutta[c], Sayanti Podder[d], Saurabh Sarkar[e], Abhratanu Ganguly[f], Moutushi Mandi[g], Salma Khatun[h]

[a] Department of Animal Science, Kazi Nazrul University, Asansol, West Bengal, India
[b] Department of Biomolecular Medicine, Faculty of Medicine and Health Sciences, Ghent University, Belgium
[c] Department of Environmental and Occupational Health Sciences, University of Washington, Seattle, WA, USA
[d] Post Graduate Department of Zoology, Modern College of Arts, Science and Commerce, Ganeshkhind, Pune, Maharashtra, India
[e] Department of Zoology, Gushkara Mahavidyalaya, Gushkara, Purba Bardhaman, West Bengal, India
[f] Post Graduate Department of Zoology, A.B.N. Seal College, Cooch Behar, West Bengal, India
[g] Toxicology Research Unit, Department of Zoology, The University of Burdwan, Purba Bardhaman, West Bengal, India
[h] Department of Zoology, Krishna Chandra College, Hetampur, West Bengal, India

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ABSTRACT

COVID-19 is the ongoing health emergency affecting individuals of all ages around the globe. Initially, the infection was reported to affect pulmonary structures. However, recent studies have delineated the impacts of COVID-19 on the reproductive system of both men and women. Hence, the present review aims to shed light on the distribution of SARS-CoV-2 entry factors in various reproductive organs. In addition, impacts of COVID-19 mediators like disrupted renin angiotensin system, oxidative stress, cytokine storm, fever, and the mental stress on reproductive physiology have also been discussed. For the present study, various keywords were used to search literature on PubMed, ScienceDirect, and Google Scholar databases. Articles were screened for relevancy and were studied in detail for qualitative synthesis of the review. Through our literature review, we found a multitude of effects of COVID-19 mediators on reproductive systems. Studies reported expression of receptors like ACE-2, TMPRSS2, and CD147 in the testes, epididymis, prostrate, seminal vesicles, and ovarian follicles. These proteins are known to serve as major SARS-CoV-2 entry factors. The expression of lysosomal cathepsins (CTSB/CTSL) and/ neuropilin-1 (NRP-1) are also evident in the testes, epididymis, seminal vesicles, fallopian tube, cervix, and endometrium. The binding of viral spike protein with ACE-2 was found to alter the renin-angiotensin cascade, which could invite additional infertility problems. Furthermore, COVID-19 mediated cytokine storm, oxidative stress, and elevated body temperature could be detrimental to gametogenesis, steroidogenesis, and reproductive cycles in patients. Finally, social isolation, confinement, and job insecurities have fueled mental stress and frustration that might promote glucocorticoid-mediated subnormal sperm quality in men and higher risk of miscarriage in women. Hence, the influence of COVID-19 on the alteration of reproductive health and fertility is quite apparent.

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* Corresponding author.
E-mail address: prem.rjk@gmail.com (P. Rajak).

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In silico study reveals binding potential of rotenone at multiple sites of pulmonary surfactant proteins: A matter of concern

Prem Rajak [a,*], Sumedha Roy [b], Achintya Kumar Pal [c], Manas Paramanik [a], Moumita Dutta [d], Sayanti Podder [e], Saurabh Sarkar [f], Abhratanu Ganguly [c], Moutushi Mandi [g], Anik Dutta [h], Kanchana Das [g], Siddhartha Ghanty [a], Salma Khatun [i]

[a] Department of Animal Science, Kazi Nazrul University, Asansol, West Bengal, India
[b] Department of Biomolecular Medicine, Faculty of Medicine and Health Sciences, Ghent University, Belgium
[c] Post Graduate Department of Zoology, A. B. N. Seal College, Cooch Behar, West Bengal, India
[d] Departments of Environmental and Occupational Health Sciences, University of Washington, Seattle, WA, USA
[e] Post Graduate Department of Zoology, Modern College of Arts, Science and Commerce, Ganeshkhind, Pune, Maharashtra, India
[f] Department of Zoology, Gushkara Mahavidyalaya, Gushkara, Purba Bardhaman, West Bengal, India
[g] Department of Zoology, The University of Burdwan, Purba Bardhaman, West Bengal, India
[h] Post Graduate Department of Zoology, Darjeeling Govt. College, Darjeeling, West Bengal, India
[i] Department of Zoology, Krishna Chandra College, Hetampur, West Bengal, India

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ABSTRACT

Rotenone is a broad-spectrum pesticide employed in various agricultural practices all over the world. Human beings are exposed to this chemical through oral, nasal, and dermal routes. Inhalation of rotenone exposes biomolecular components of lungs to this chemical. Biophysical activity of lungs is precisely regulated by pulmonary surfactant to facilitate gaseous exchange. Surfactant proteins (SPs) are the fundamental components of pulmonary surfactant. SPs like SP-A and SP-D have antimicrobial activities providing a crucial first line of defense against infections in lungs whereas SP-B and SP-C are mainly involved in respiratory cycle and reduction of surface tension at air–water interface. In this study, molecular docking analysis using AutoDock Vina has been conducted to investigate binding potential of rotenone with the four SPs. Results indicate that, rotenone can bind with carbohydrate recognition domain (CRD) of SP-A, N-, and C- terminal peptide of SP-B, SP-C, and CRD of SP-D at multiples sites via several interaction mediators such as H bonds, C–H bonds, alkyl bonds, pi-pi stacked, Van der Waals interaction, and other. Such interactions of rotenone with SPs can disrupt biophysical and anti-microbial functions of SPs in lungs that may invite respiratory ailments and pathogenic infections.

1. Introduction

Pesticide pollution is a major global health concern. Indiscriminate application of pesticides has contaminated almost every component of the biosphere. Till date, numerous pesticides have been formulated. According to the target organism, pesticides are classified as herbicides, fungicides, insecticides, rodenticides, nematicides, and molluscicides. These chemicals target specific metabolic pathways in pests to control their population. However, they may interrupt various biomolecules in organisms other than pests to elicit toxic responses. Numerous studies have reported pesticide-induced oxidative stress, cytotoxicity, and organotoxicity on human and model organisms (Mandi et al., 2020; Khatun et al., 2018; Rajak et al., 2018; Sarkar et al., 2018; Nicolopoulou-Stamati et al., 2016; Podder and Roy, 2015; Rajak et al., 2015). Additionally, pesticide exposure can disrupt protein homeostasis and augment pathogenicity of infectious as well as fatal diseases (Rajak et al., 2021; Rajak and Roy, 2018).

Rotenone is a colorless, odorless and crystalline heteropentacyclic broad-spectrum insecticide derived from the roots and stems of *Lonchocarpus* and *Derris* species. It is lipophilic in nature and therefore can easily cross lipid bilayer of cells in several tissues. Rotenone is an established inhibitor of complex I of the mitochondrial electron

Abbreviations: ALA, Alanine; ARG, Arginine; ASN, Asparagine; ASP, Aspartic acid; CYS, Cysteine; GLN, Glutamine; GLU, Glutamic acid; GLY, Glycine; HIS, Histidine; ILE, Isoleucine; LEU, Leucine; LYS, Lysine; MET, Methionine; PHE, Phenylalanine; PRO, Proline; SER, Serine; THR, Threonine; TRP, Tryptophan; TYR, Tyrosine; VAL, Valine.

* Corresponding author.
E-mail address: prem.rjk@gmail.com (P. Rajak).

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Immunotoxic role of organophosphates: An unseen risk escalating SARS-CoV-2 pathogenicity

Prem Rajak [a,*], Abhratanu Ganguly [b], Saurabh Sarkar [c], Moutushi Mandi [d], Moumita Dutta [e], Sayanti Podder [f], Salma Khatun [g], Sumedha Roy [h]

[a] Department of Animal Science, Kazi Nazrul University, Asansol, West Bengal, India
[b] Post Graduate Department of Zoology, A.B.N. Seal College, Cooch Behar, West Bengal, India
[c] Department of Zoology, Gushkara Mahavidyalaya, Gushkara, Purba Bardhaman, West Bengal, India
[d] Toxicology Research Unit, Department of Zoology, The University of Burdwan, Purba Bardhaman, West Bengal, India
[e] Department of Environmental and Occupational Health Sciences, University of Washington, Seattle, Washington, USA
[f] Post Graduate Department of Zoology, Modern College of Arts, Science and Commerce, Ganeshkhind, Pune, Maharashtra, India
[g] Department of Zoology, Krishna Chandra College, Hetampur, West Bengal, India
[h] Department of Biomolecular Medicine, Faculty of Medicine and Health Sciences, Ghent University, Belgium

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ABSTRACT

Consistent gathering of immunotoxic substances on earth is a serious global issue affecting people under pathogenic stress. Organophosphates are among such hazardous compounds that are ubiquitous in nature. They fuel oxidative stress to impair antiviral immune response in living entities. Aside, organophosphates promote cytokine burst and pyroptosis in broncho-alveolar chambers leading to severe respiratory ailments. At present, we witness COVID-19 outbreak caused by SARS-CoV-2. Infection triggers cytokine storm coupled with inflammatory manifestations and pulmonary disorders in patients. Since organophosphate-exposure promotes necroinflammation and respiratory troubles hence during current pandemic situation, additional exposure to such chemicals can exacerbate inflammatory outcome and pulmonary maladies in patients, or pre-exposure to organophosphates might turn-out to be a risk factor for compromised immunity. Fortunately, antioxidants alleviate organophosphate-induced immunosuppression and hence under co-exposure circumstances, dietary intake of antioxidants would be beneficial to boost immunity against SARS-CoV-2 infection.

1. Introduction

With the advancement of scientific revolution, human beings have made the existing anthropocene more comfortable for their daily life. From agricultural field to the industrial sector, human populations are blessed with the use of modern technologies and equipments, which not only reduce energy for production but also enhance yield at the same time. But the darker side of such advancement includes consistent gathering of detrimental chemicals in the environment contaminating almost every component of biosphere. These chemicals have secured their apparent presence in several drugs, food stuffs, household products, drinking water, agrochemicals and so on. Organophosphates (OPs) are among such hazardous compounds that are being globally used on a regular basis.

OPs are amides, esters, or thiol derivatives of phosphoric acid. These chemicals are extensively used in agriculture, horticulture, forestry, veterinary-medicine, domestic purpose and also for the control of vector-borne diseases. Certain OPs are being used to treat head-lice, scabies and crab-lice in humans (Idrus and Levitt, 2009). In agricultural sector, OPs are extensively applied to eradicate pests including locusts, aphids, leaf miners, fire ants, thrips and caterpillars. These pesticides augment both quantity and quality of agricultural products (Chang et al., 2017). OPs namely tris-(2-chloro, 1-methyl-ethyl) phosphate, tris-(2-chloroethyl) phosphate, tri-n-butyl phosphate, tri-iso-butyl phosphate, triphenylphosphate and tris-(butoxyethyl) phosphate are admixed flame retardants and plasticisers at public places

* Corresponding author.
E-mail address: prem.rjk@gmail.com (P. Rajak), gangulyabhratanu@gmail.com (A. Ganguly), saurabhsarkar91@gmail.com (S. Sarkar), mandimoutushi496@gmail.com (M. Mandi), dmoumita1989@gmail.com (M. Dutta), podder.sayan@gmail.com (S. Podder), skhatun14.14@gmail.com (S. Khatun), sumedha.roy@ugent.be (S. Roy).

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RESEARCH ARTICLE

Bioaccumulation pattern of heavy metals in fish tissues and associated health hazards in human population

Joyita Mukherjee[1] · Nimai Chandra Saha[2] · Samya Karan[3]

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Abstract
The study vigilantly considered the load of Pb, Cd, Cr, Cu, and Zn in a variety of tissues (muscle, gills, and liver) of 5 fish species (*Mystus gulio*, *Notopterus notopterus*, *Notopterus chitala*, *Mugil cephalus*, and *Glossogobius giuris*) collected from six sites in the lower Gangetic area. The study showed the lowest concentration of metals in the muscles. The accumulated patterns of heavy metals differed in different regions and concentrations fluctuated between the liver and gills. The target hazard quotient (THQ) value has been measured in contaminated fish. The THQ values for all the metals in respective fishes are below 1 that indicate that indirect intake of metals by consuming these selected fishes will not result in potential health hazard in human. The estimated daily intake (EDI) results were also calculated. EDI levels of all elements are lower than the permissible limit indicating a lower chance for health risk to occur. However, doses below the recommended levels do not indicate that they are completely safe for consumption or those above are not to be used. Thus, it can be demonstrated that occurrence of Cd, Cr, Pb, Cu, and Zn in the preferred tissues of the selected fish species in the present study may not pretense severe human health risk after consumption at its existing concentration.

Keywords Heavy metal · Fish tissue · Accumulation pattern · Target hazard quotient · Estimated daily intake · Potential health hazard

Introduction

Pollution load always serves as a potential hazard to the aquatic system. Exponential rise of populace and expansion of economic status are the reason of sharp increase in metal pollution (Ghaneian et al. 2014; Saha et al. 2016; Sanchooli Moghaddam et al. 2016). Most of the metals such as cadmium, chromium, lead, nickel, and mercury are toxic when exposed to the animal tissues (Makedonski et al. 2017; Taghavi et al. 2015). Widespread application of metals is, therefore, raising concern over their potential effects on aquatic ecosystems and human health also (Tchounwou et al. 2012; Zazouli et al. 2013). Some of the metals (Co, Cr, Cu, Fe, Mn, Mo, Ni, Se, Zn) are considered as essential elements for the organisms, being ingredients of several key enzymes and playing vital roles in various reactions (WHO/FAO/IAEA 1996). However, increased prevalence of these may lead to several cellular and tissue damage (Chang et al. 1996; Tchounwou et al. 2008). Others metals, such as Hg, Pb, Cd, and As, are considered as non-essential and are potentially toxic (Chang et al. 1996; Inoue 2013) at relatively low concentrations.

Most of the aquatic organisms are extremely sensitive to many toxicants. Fish is the most convenient biological model to indicate aquatic health (Adams and Ryon 1994). Production and accumulation of heavy metals relies on variety of natural and anthropogenic sources (Bauvais et al. 2015; Gupta et al. 2015). Fish is integral part of diet due to its high protein content, omega-3 fatty acids, and vitamins (Hao et al. 2013; Taweel et al. 2013). Global per capita fish consumption is above 20 kg year^{-1} (FAO 2016). In India, annual per capita fish consumption is 5–6 kg for general population and 8–9 kg for only fish-eating population. Population

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✉ Joyita Mukherjee
joyitamukherjee07@gmail.com; jm.zoo@kccollege.ac.in

[1] Department of Zoology, Krishna Chandra College, Hetampur, West Bengal, India

[2] Vice Chancellor's Research Group, Department of Zoology, The University of Burdwan, Burdwan, West Bengal, India

[3] Department of Environmental Science, Vidyasagar University, Midnapore, West Bengal, India

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Spatial heterogeneity within habitat indicates the community assemblage pattern and life strategies

Mahammed Moniruzzaman [a], Amiya Ranjan Bhowmick [b], Samya Karan [a], Joyita Mukherjee [c,*]

[a] Department of Zoology, University of Calcutta, Kolkata 700019, India
[b] Department of Mathematics, Institute of Chemical Technology, Mumbai, India
[c] Department of Zoology, Krishna Chandra College, Hetampur, West Bengal, India

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Aquatic ecosystem

ABSTRACT

The problem of life strategies in relation to the alteration of habitat quality remains one of the fundamental questions in ecology and evolution. Spatial analysis of community assemblage for organisms could be a useful insight to resolve this issue. An important tropical riverine ecosystem, the Ganges, has been considered for this study. The River Ganges supports a diverse fish fauna, with about 300 fish species reported for Indian waters. The emergence and maintenance of life strategy of fish are naturally regulated in response to the variation of abiotic factors in different ways. Here, we formulate a spatial model using Self Organizing map (SOM), with monthly surveys of local fisheries from nine principal landing sites along the lower stretch of the Ganges. We explored the conditions for selecting life history strategies based on prevailing abiotic factors of habitat. Parameters of water quality incur heterogeneity within a continuous habitat. It is already reported that the fishery in this area is at a stake due to over exploitation and the catch per unit effort (CPUE) is declining as an invariable outcome. Thus, an assessment of community assemblage of this area is of principal importance for managing aquatic resources in the lower Ganges. The primary goal is to test the hypothesis that fish faunal community structure and assemblage along with their life strategy can change along the gradient of water quality parameters down the stretch of lower Ganges. Data on average annual yield (total mean monthly catch) was considered for analysis. Statistical ordination revealed associations between assemblage composition and abiotic factors. Patterns of fish community composition are associated with species life-history strategies which, in turn, are influenced by their quality of habitat. Therefore, the anthology of abiotic factors, controlling the immediate habitat of organisms, has paramount role to serve as the indicators of habitat quality and life history strategies following eco-evolutionary aspects.

1. Introduction

Distribution and abundance of a particular species are function of habitat characteristics and biological factors (Taylor et al., 1993). Habitat quality is always a significant parameter while studying fish community and alteration in habitat affects the species composition and therefore, the structure of fish community is hampered (Mohamed, 1998). Alteration in habitat is noted to be one of the most important stressors of aquatic systems (Karr, 1986). In the Ganges river basin, alterations in fish diversity and community structure are caused mostly due to hydrological alterations, over fishing, dam constructions, changing land use pattern, pollution, water diversions, exotic species invasion, rapid sedimentation, deforestation, climatic changes and land erosion etc. Understanding of community assemblage patterns is the most elementary step to achieve the sustainable management of aquatic ecosystems.

Riverine ecosystem of India has suffered from extreme human interference resulting in habitat loss and degradation. Many fresh water fish species have become endangered, particularly in Ganges basin, where demand is very high. Fisheries are one of the major livelihoods and provide food security to millions of people around the world, specifically in tropical region (Welcomme, 2006). According to a previous report, a total of 155 fish species of 49 families and 15 orders were documented from the tidal freshwater zone of the Hooghly estuary (Roshith et al., 2013). Among these 155 fish species there are 35 species which have high commercial value (Islam et al., 2006). Due to seasonal

* Corresponding author.
E-mail addresses: jm.zoo@kccollege.ac.in, joyita.mukherjee@visva-bharati.ac.in (J. Mukherjee).

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Managing Editor and Publisher
(*Former Professor* and HoD: Geography
Presidency College/ University, and Chandernagore College, West Bengal, India.
Currently, Visiting Faculty: North Bengal University, West Bengal, India.
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Urban Agglomerations and Changing Landuse Patterns in Murshidabad district, West Bengal, India

Sanjay Mandal[1#], and Dr. Uma Sankar Malik[2]

[1]*Research Scholar*: Department of Geography, Visva-Bharati, Santiniketan, West Bengal
[2]*Professor*: Department of Geography, Visva-Bharati, Santiniketan, West Bengal

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Independent and Dependent Urban Agglomerations (UAs), Census Towns (CTs), Statutory Towns (STs), Urban Primacy, Outgrowths (OGs).

Abstract

The Census of India used to produce reports on the growth of municipal urban agglomerations only. However, there are numerous agglomerations in the Murshidabad district that are independent or non-municipal agglomerations, commonly associated with the growth of census towns in the district. This article attempts to demonstrate how the growth of census towns and municipalities affects the district's increasing number of urban agglomerations. The paper focuses on the demographic differentiation between the district's various agglomerations. The emphasis in this section has also been placed on the spatiotemporal change in landuse and land cover pattern in those regions. The primacy index is used to determine whether or not the agglomeration contains any primate urban centres. The rank size rule is applied to agglomerations with populations greater than ten thousand. The satellite image is supervised classified using ArcGIS 9.3 software to identify the spatial spread in the landuse pattern in these urban agglomerations over the last two decades.

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Introduction

In India, the majority of large cities are becoming self-sufficient. Currently, as the country develops rapidly, the number of urban settlements is also growing and are becoming contiguous, forming thereby urban agglomerations with any of the following combinations:

1. first, a region or town with a continuous outgrowth that is outside the statutory limits but within the boundaries of the adjoining village or villages, or
2. More than one adjoining towns with their outgrowths, or
3. a city and one or more adjoining towns with outgrowths which forms a continuous spread (Indian Census, 2001).

An urban agglomeration is defined as a continuous urban spread consisting of a town and its adjoining outgrowths, or two or more physically contiguous towns with or without outgrowths of such towns (Office of the Registrar General, India, 2008). According to the 2011 Census, an Urban Agglomeration must include at least one statutory town, and its total population (i.e., all constituents combined) cannot be less than 20,000. (NCERT Solutions,2015-20). In Denmark, the minimum population for an agglomeration to be considered urban is 200, in France it is 2000, and in Greece it is 10000 (Denis et al, 2011).

There are similar other combinations that have been treated as urban agglomerations in varying local conditions that satisfy the basic condition of contiguity (Singh, 2014). Examples include Delhi UA, Greater Mumbai UA, and so on. In India, 475 places with 981 OGs were identified as Urban Agglomerations in the 2011 Census, compared to 384 UAs with 962 OGs in the 2001 Census.

An Out Growth (OG) is a viable unit, such as a village or hamlet, or an enumeration block made up of such a village or hamlet that can be identified by its boundaries and location. Examples include a railway colony, a university campus, a port area, military camps, and other developments near a statutory town that are outside its statutory limits but within the revenue limits of a village or villages contiguous to the town (Census of India definition, 2011). When determining the outgrowth of a town, it is ensured that it possesses urban features in terms of infrastructure and amenities such as pucca roads, electricity, taps, drainage system for wastewater disposal, etc. educational institutions, post offices, medical facilities, banks, and so on and is physically contiguous with the core town of the Urban Agglomeration (CoI, 2011). Each such town, along with its outgrowths, is treated as an integrated urban area and is referred to as a 'urban agglomeration' (Kapila, 1993). Table 1 depicts the rising trend of India's urban sectors and agglomerations.

Table -1 shows that as the number of CTs and STs increased, so did the number of agglomerations in India. West Bengal's Murshidabad district has the state's highest rate of growth of census town (CT). It had 22 CTs in 2001, which increased to 65 in 2011 (Census of India, 2011).As CTs expand in a contiguous manner, these settlements tend to form more agglomeration in the

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ORIGINAL RESEARCH ARTICLE

Fabrication and Characterization of Back-to-Back Schottky Diode in Ni/ZnO/Ag Nanojunction

Rini Labar[1] · **Tapas Kumar Kundu**[2]

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Abstract

This work presents the fabrication and electrical analysis of a ZnO nanostructure-based Schottky device. The fabrication method employed is easy and cost-effective. The junction properties of the Ni/ZnO junction annealed at 400ºC with silver probing has been studied leading to the formation of a metal–semiconductor–metal (MSM) back-to-back Schottky diode (BBSD) with the configuration Ni/ZnO/Ag; this is a rectifying diode for both $V > 0$ and $V < 0$. The junction properties have been analyzed employing the BBSD model in the light of the thermionic emission mechanism. Electrical parameters, like barrier height, ideality factor, and resistance of a device consisting of two diodes, have been determined based on the theory for the BBSD model. The diode action is lost when the specimen is annealed at 700ºC due to the combined effect of the microstructure of ZnO and the growth of a NiO layer at the interface.

Keywords MSM (metal–semiconductor–metal) · BBSD (back-to-back Schottky diode) · sol–gel · nano-schottky contact

Introduction

ZnO, which shows *n*-type conductivity in its native form due to the presence of oxygen vacancies and interstitial defects, has gained much popularity for applications such as diodes, actuators, gas sensors, solar cells, etc. In addition ZnO also possesses good carrier confinement and a wide direct bandgap (~ 3.37 eV) and high exciton binding energy (~ 60 meV), which makes it more preferable for optoelectronic device applications.[1-6] With growing interest in the study of ZnO-based device applications, it has been observed that nanostructured ZnO has a high aspect ratio which enhances the operating capability of ZnO-based devices for applications at high temperature as well as in harsh environments.[2] Reports have also shown that nanostructure-based devices show better responsivity, making them more preferable for applications as sensing devices.[7] ZnO nanostructures, such as nanowires, nanofibers, and nanorods, etc., have been widely used for fabricating devices, but although fairly popular, the fabrication technique is quite complex and time-consuming for mass scale production, so that easily attainable colloidal ZnO nanoparticles have often been preferred as active material for ZnO-based optoelectronic devices.

The metal–semiconductor (MS) junction or the Schottky junction has in particular been widely studied for its wide range of applications, such as photodetectors, gas sensing devices, chemical sensing devices, etc. It has been observed that the electrical properties of such devices are influenced by the carrier transport mechanism at the metal–semiconductor interface. The Schottky junction, which displays a rectifying property unlike the ohmic contacts, can be realized with a certain barrier at the interface of the metal–semiconductor junction, whereas an Ohmic junction is devoid of any barrier. In recent years, metal–semiconductor–metal (MSM) Schottky junctions have gained much popularity, and the current transport mechanism of such devices has been explored and proposed for a variety of applications, such as memory devices, current limiters, photodetectors, gas sensing devices, chemical sensing devices, and current regulators.[2,8-11] Recent works have been published in which the authors have shown that the device sensitivity increases for a MSM Schottky junction as compared to a MS junction. Also, in addition to this attractive feature, the hassle to obtain a perfectly ohmic junction can be eliminated altogether by considering two rectifying junctions instead.[12,13] MS and metal–insulator–metal devices have been

✉ Tapas Kumar Kundu
tapaskumar.kundu@visva-bharati.ac.in

[1] Department of Physics, Krishna Chandra College, Hetampur, Birbhum, West Bengal, India

[2] Department of Physics, Visva Bharati University, Santiniketan, West Bengal, India

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REVIEW

Cytotoxicity of natural flavones and flavonols against different cancer cells

Arindam Gangopadhyay[1] · Syamantak Chakraborty[2] · Shyamal K. Jash[3] · Dilip Gorai[4]

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Abstract

Flavones and Flavonols, two major sub-classes of flavonoids, are plant secondary metabolites possessing immense biological activities including cytotoxic activities. They are polyphenolic phytochemicals that exist either as free aglycones or as glycosidic conjugates. Diversities in structural patterns of these two sub-classes of flavonoids make them promising agents in anticancer research. In the recent research, plant-derived natural compound become the hot point of study for the safe and effective drug. So search of new natural flavones or flavonol, cytotoxic to cancer cell is of major attention to the chemists now. The present review describes 146 new examples of naturally occurring flavones and flavonols having cytotoxic potential against different cancer cells reported during the period of 2005 to 2020.These compounds comprise flavones, flavonols and isoflavones. These compounds are classified according to their structures. Most of the flavones and flavonols are reported active against human breast cancer, liver cancer and lung cancer cells.The main topics addressed are source, structures, cytotoxic activity against various cancer cells in details, activity-wise classification of the compounds, mechanism of cytotoxicity and possible structure–activity relationship. The review cites 145 references.

Keywords Natural flavones and flavonols · Cytotoxicity · Anticancer activity · Mechanism · Structure–activity relationship

Abbreviations

Glc	Glucopyranosyl
Rha	Rhamnopyranosyl
Arab	Arabinofuranosyl
Gal	Galloyl
Rut	Rutinosyl
Lav	Lavandulyl
Quin	Quinovopyranosyl
MTT	3-(4,5 Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide
P 388	Lymphoblastic lymphoma of pre-B cell
HepG2	Human liver cancer cell
SGC-7901	Gastric carcinoma cell
MCF-7	Human breast cancer cell
COLO 205	Human adenocarcinoma cell line
MDA-231 and T47D	Breast cancer cell
A-549	Human lung cancer cell
HL-60	Human acute promyelocytic cell
H-460	Large cell lung carcinoma
KB	Human epidermal Carcinoma cell
A375S2	Human melanoma cells
HeLa	Human epithelial carcinoma cell line
PC3	Human prostate carcinoma cell
HT29	Human colon cancer
NCI-H187	Human small-cell lung cancer cell
BGC-823	Human stomach carcinoma
HCT-8	Human ileocecal adenocarcinoma
B 16	Human melanoma cell lines
Caco2	Human colorectal cancer cell line
U 937	Human histiocytic leukemia cell
NB4	Human promyelocytic leukemia cell line
SHSY5Y	Human neuroblastoma
PANC-1	Human pancreatic cancer cell
HCT-116	Human colon cancer cell

✉ Arindam Gangopadhyay
gangulya2002@gmail.com

[1] Department of Chemistry, Rampurhat College, Rampurhat, Birbhum, West Bengal, India

[2] Department of General Medicine, KPC Medical College, Jadavpur, Kolkata, West Bengal, India

[3] Department of Chemistry, Krishna Chandra College, Hetampur, Birbhum, West Bengal, India

[4] Department of Chemistry, Bolpur College, Bolpur, Birbhum, West Bengal, India

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তবু একলব্য

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নীল বিদ্রোহ : একটি বস্তুনিষ্ঠ সমীক্ষা

পিনাকী দে

পলাশির যুদ্ধ থেকে ১৯৪৭-এর দেশবিভাগ পর্যন্ত এই উপমহাদেশে ইংরেজরা ১৯০ বছর ক্ষমতায় অধিষ্ঠিত ছিল। এই সময়কালে বহু চাঞ্চল্যকর ঘটনার মধ্যে যে তিনটি বিষয়ের ইতিহাসকে সবচেয়ে গুরুত্বপূর্ণ ও সুদূরপ্রসারী হিসেবে চিহ্নিত করা নিতান্ত অপরিহার্য বলে মনে হয়, সে তিনটি বিষয় ঐতিহাসিকরা হয় অত্যন্ত সন্তর্পণে এড়িয়ে গেছেন, না হয় সে সম্পর্কে বিকৃত তথ্য লিপিবদ্ধ করেছেন। এর প্রথমটি হলো ইংরেজ বিরোধী অসংখ্য কৃষক বিদ্রোহ, দ্বিতীয়টি ১৮৫৭ সালের মহাবিদ্রোহ এবং তৃতীয়টি হলো ১৯০৫-এর বঙ্গভঙ্গ বিরোধী আন্দোলন। এই সমস্ত বিদ্রোহগুলির মধ্যে অন্যতম হলো ১৮৫৯-৬০ খ্রি. সংঘটিত নীল বিদ্রোহ। মূলত এই বিদ্রোহ জমিদার, মহাজন বিরোধী কোনো আন্দোলন নয়। এটি ছিল নীলকর সাহেবদের বিরুদ্ধে সংঘটিত এক স্বতঃস্ফূর্ত বিদ্রোহ। নীলকুঠির সাহেবরা ছিল মূলত কৃষকদের মূল প্রতিপক্ষ।

বাংলা ও বিহারে নীল চাষের সূত্রপাত হয় ১৭৭২ সালে। এই বছরে লুই বঞ্চো নামে এক ফরাসি চন্দননগরের কাছাকাছি গোন্দলপাড়া গ্রামে প্রথম নীলকুঠি স্থাপন করেন। ১৭৭৩ সালে তিনি চুঁচুড়ার কাছে তালডাঙায় আর একটি নীলকুঠি প্রতিষ্ঠা করেন। এই সময় ক্যারল ব্লুম নামে একজন ইংরেজ নীল চাষ শুরু করেন এবং দুজন ফরাসি ডাক্তারের উদ্যোগে নীলকুঠি স্থাপিত হয় হাওড়ায়। ১৭৭৮ সালে ব্লুম লাভজনক নীলের ব্যবসার প্রতি ইস্ট ইন্ডিয়া কোম্পানির দৃষ্টি আকর্ষণ করেন এবং ব্যাপকভাবে নীল চাষ শুরু করার জন্য আবেদন জানান। ১৭৮৩ সালের মধ্যে বাংলার বিভিন্ন জেলায় বহু নীলকুঠি স্থাপিত হয় এবং এই বছরে বাংলা থেকে ইংল্যান্ডে ১২০০-১৩০০ মন নীল রপ্তানি হয়।

১৮ শতকের মধ্যভাগে ইংল্যান্ডের শিল্প বিপ্লবের জের হিসেবে দ্রুত বস্ত্রশিল্প গড়ে উঠলে নীলের চাহিদা ব্যাপকভাবে বৃদ্ধি পায়। প্রাপ্ত তথ্যের ভিত্তিতে জানা যায় যে, এই সময় ইস্ট ইন্ডিয়া কোম্পানি বাংলায় যে নীল প্রতি পাউন্ড চার আনায় ক্রয় করত, ইংল্যান্ডে তার বিক্রয়মূল্য ছিল পাঁচ থেকে সাত টাকার মতো এবং বাংলা থেকেই সমগ্র বিশ্বের নীলের চাহিদা মেটানো হতো। এই অর্থনৈতিক শোষণের স্বরূপ সম্বন্ধে নীল চাষিরা ক্রমশ সজাগ হয়ে ওঠে এবং প্রতিরোধের প্রস্তুতি নেয়। উনিশ শতকের মাঝামাঝি সময়কে নীল বিদ্রোহের প্রকৃত কাল ধরা হয়। যদিও বাংলায় নীলকরদের অত্যাচার নীলচাষের গোড়া থেকে শুরু হয়ে গিয়েছিল। শুধু তাই নয়, কোনো কোনো নীলকরের অত্যাচারের বিরুদ্ধে মানুষের রুখে দাঁড়ানোর ঘটনা বিচ্ছিন্ন ভাবে প্রথম থেকেই ঘটেছে এখানে ওখানে। কিন্তু সামগ্রিকভাবে নীল চাষের বিরুদ্ধে দেশজোড়া গণজাগরণ হয়েছিল তখনই অর্থাৎ ১৮৫৯-৬০ সালে। এটাই হলো উপমহাদেশে ইংরেজ

INSIGHT

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GLOBALIZATION: WHY INDIA RESORTED TO GLOBALIZATION

Dr Rintu Kumar Biswas
Associate Professor of Political Science
Krishna Chandra College
Hetampur, Birbhum, WEST BENGAL

ABSTRACT:
It is argued by the scholars that the rapidly changing global economy is the compelling reason for the sweeping economic reforms initiated in the country. The reform process has now got into second phase with the full convertibility of the rupee on current account transactions and the slashing of custom duties to a great extent, in particular, both of which emerged as special measures taken in the budgets initiated by the Union Government since 1991. The efforts are now being made to integrate further the Indian economy with the emerging global economy.
What is the nature of the global economy out there? Who are the main participants in it? How does the national economy of India get integrated with it? How Transnational Corporations (TNCs) or Multinational Corporations (MNCs) do generally play a crucial role in the emerging global economy?What is the nature of the engagement between these bodies and the national economies? These are some of the questions which have been raised and analysed in the present research work .It will also consider theoretically how the global economy impacted on the economy of India as she responded to structural adjustment programme liberalization, privatization, and globalization.
Keywords: *Globalization, Indian Economy, New Economic Policy,Multi NationalCorporations, Trans National Corporations*

INTRODUCTION

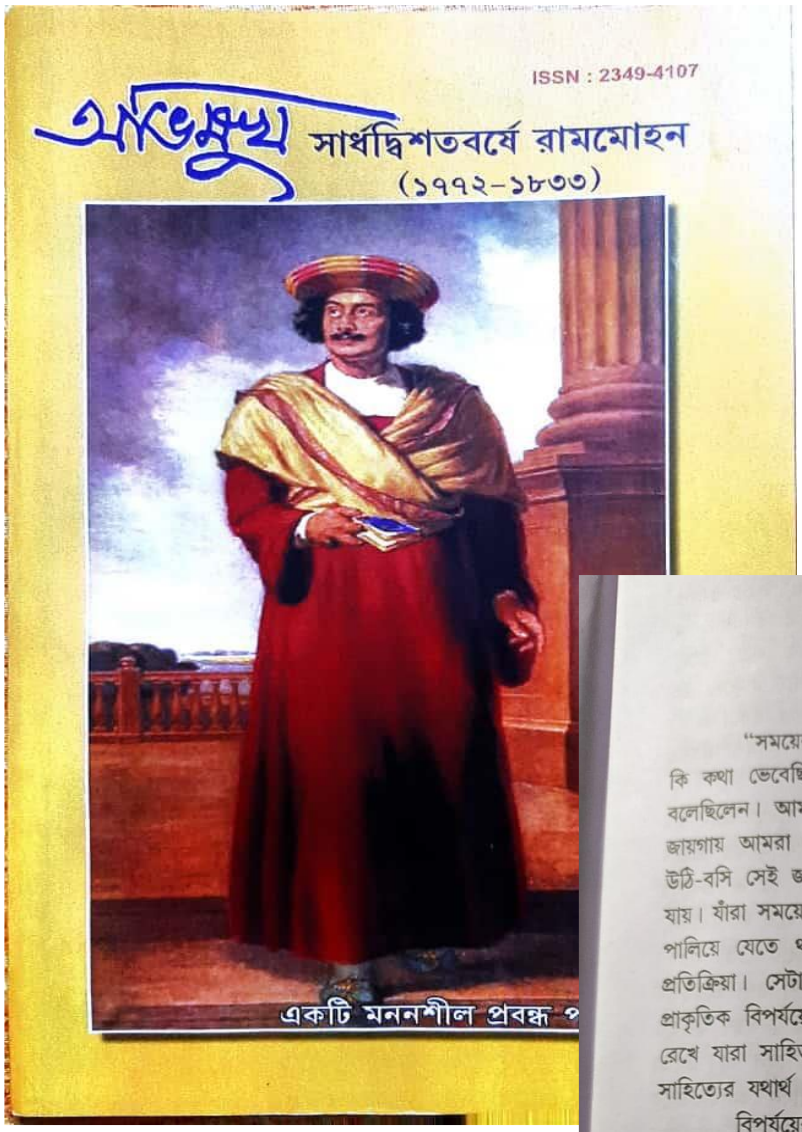
The developing world from 1970 onward witnessed a wave of economic policy reforms with one country after another taking recourse to the liberalization process. The process has been described by many critics as an act of imposition exercised by the International Financial Institutions. The reform process initiated by the developing world had been preceded by a quarter- century of state-directed efforts of economic development, during which time the goals of economic self reliance and Import Substitution industrialization (IST) were the hall marks of development strategies in the less developed countries. These goals seemed particularly justified, given the long experience of these countries with colonialism and the agricultural nature of these countries. Besides these, there was intellectual support for them from Keynesianism and the new discipline of development economics, especially in view of the historical memories of the massive market failures of the Great Depression Years (1930-1940). However, the present globalization wave has overtaken all those developments.

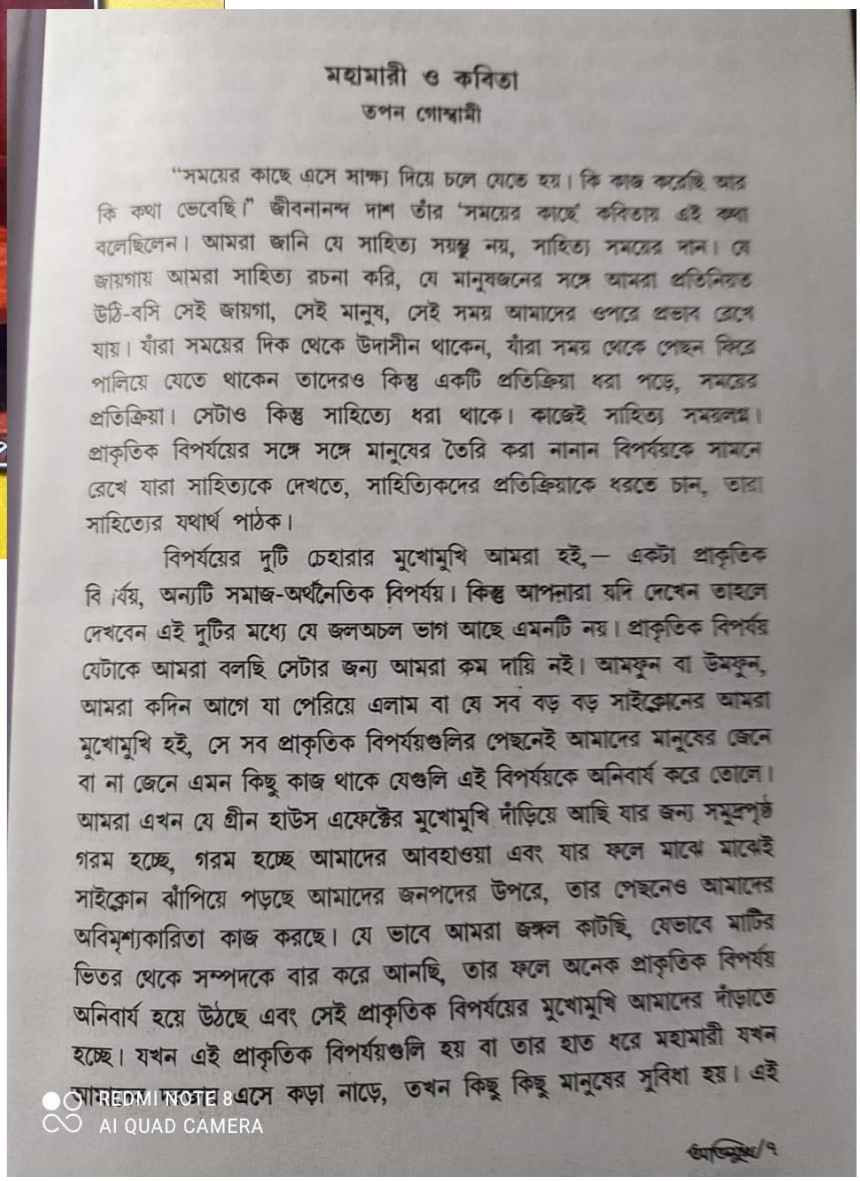
Three Reservations need to be taken into Consideration

Firstly in the context of the international economy the relationship of one of its units with others is of a

Department of Bengali

Dr. Tapan Goswami





মহামারী ও কবিতা

তপন গোস্বামী

"সময়ের কাছে এসে সাক্ষ্য দিয়ে চলে যেতে হয়। কি কাজ করেছি আর কি কথা ভেবেছি।" জীবনানন্দ দাশ তাঁর 'সময়ের কাছে' কবিতায় এই কথা বলেছিলেন। আমরা জানি যে সাহিত্য স্বয়ম্ভু নয়, সাহিত্য সময়ের দান। যে জায়গায় আমরা সাহিত্য রচনা করি, যে মানুষজনের সঙ্গে আমরা প্রতিনিয়ত উঠি-বসি সেই জায়গা, সেই মানুষ, সেই সময় আমাদের ওপরে প্রভাব রেখে যায়। যাঁরা সময়ের দিক থেকে উদাসীন থাকেন, যাঁরা সময় থেকে পেছন ফিরে পালিয়ে যেতে থাকেন তাদেরও কিন্তু একটি প্রতিক্রিয়া ধরা পড়ে, সময়ের প্রতিক্রিয়া। সেটাও কিন্তু সাহিত্যে ধরা থাকে। কাজেই সাহিত্য সময়লগ্ন। প্রাকৃতিক বিপর্যয়ের সঙ্গে সঙ্গে মানুষের তৈরি করা নানান বিপর্যয়কে সামনে রেখে যারা সাহিত্যকে দেখতে, সাহিত্যিকদের প্রতিক্রিয়াকে ধরতে চান, তারা সাহিত্যের যথার্থ পাঠক।

বিপর্যয়ের দুটি চেহারার মুখোমুখি আমরা হই,— একটা প্রাকৃতিক বি র্যয়, অন্যটি সমাজ-অর্থনৈতিক বিপর্যয়। কিন্তু আপনারা যদি দেখেন তাহলে দেখবেন এই দুটির মধ্যে যে জলঅচল ভাগ আছে এমনটি নয়। প্রাকৃতিক বিপর্যয় যেটাকে আমরা বলছি সেটার জন্য আমরা কম দায়ি নই। আমফুন বা উমফুন, আমরা কদিন আগে যা পেরিয়ে এলাম বা যে সব বড় বড় সাইক্লোনের আমরা মুখোমুখি হই, সে সব প্রাকৃতিক বিপর্যয়গুলির পেছনেই আমাদের মানুষের জেনে বা না জেনে এমন কিছু কাজ থাকে যেগুলি এই বিপর্যয়কে অনিবার্য করে তোলে। আমরা এখন যে গ্রীন হাউস এফেক্টের মুখোমুখি দাঁড়িয়ে আছি যার জন্য সমুদ্রপৃষ্ঠ গরম হচ্ছে, গরম হচ্ছে আমাদের আবহাওয়া এবং যার ফলে মাঝে মাঝেই সাইক্লোন ঝাঁপিয়ে পড়ছে আমাদের জনপদের উপরে, তার পেছনেও আমাদের অবিমৃশ্যকারিতা কাজ করছে। যে ভাবে আমরা জঙ্গল কাটছি, যেভাবে মাটির ভিতর থেকে সম্পদকে বার করে আনছি, তার ফলে অনেক প্রাকৃতিক বিপর্যয় অনিবার্য হয়ে উঠছে এবং সেই প্রাকৃতিক বিপর্যয়ের মুখোমুখি আমাদের দাঁড়াতে হচ্ছে। যখন এই প্রাকৃতিক বিপর্যয়গুলি হয় বা তার হাত ধরে মহামারী যখন আমাদের কাছে এসে কড়া নাড়ে, তখন কিছু কিছু মানুষের সুবিধা হয়। এই

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Online Shopping Behaviour of People in Emerging Cities of India: A Case Study for West Bengal

Shyamal Garai and Tarit Kanti Sen***

ABSTRACT

With the wide use of smart-phone and internet in this pandemic situation, the growth of e-commerce has increased dramatically. Therefore, business organizations may need to know about the behaviour of people to set up effective marketing strategies to convert the potential customers into active one. The study is an exploratory study for both qualitative and quantitative analysis to examine the behaviour of consumers related to online shopping. The study is based on primary data for which cluster and random sampling methods have been used for selecting the study area. The study showed that most of the respondents of the emerging cities have a positive attitude towards online shopping though it may depend on some demographic factors of the consumers. The study has also identified the main reasons for preferring and avoiding the online shopping option.

Keywords: *E-commerce; Buying behaviour; Online shopping; Emerging cities in West Bengal.*

1.0 Introduction

We are living in an era of global economy. Due to emerging growth of the internet, it is very easy to communicate with each other, living in any part of the world, through the internet. Business people are not excluded from it.

**Corresponding author; Assistant Professor, Department of Commerce, Krishna Chandra College, Hetampur, West Bengal, India (E-mail: shyamalgarai@gmail.com)*
***Assistant Professor, Department of Commerce, Bolpur College, University of Burdwan, Asansol, West Bengal, India (E-mail: siliguritarit@yahoo.co.in)*

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RESEARCH ARTICLE

WILEY

An efficient interpolating wavelet collocation scheme for quasi-exactly solvable Sturm–Liouville problems in $\mathbb{R}^+$

Debabrata Singh | **M. K. Saha** | **Sayan Banik** | **Madan Mohan Panja**

Department of Mathematics, Visva-Bharati University, Santiniketan, 731235, India

Correspondence
Madan Mohan Panja, Department of Mathematics, Visva-Bharati University, Santiniketan 731235, West Bengal, India.
Email: madanpanja2005@yahoo.co.in

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This investigation is an attempt to obtain a highly accurate approximation of the spectrum of Sturm–Liouville problems in $\mathbb{R}^+$ by representing the unknown solution of the model in the interpolating wavelet basis of $L^2(\mathbb{R})$. To accomplish the goal, the domain $\mathbb{R}^+$ has been stretched to $\mathbb{R}$ to avoid the additional care of the elements in the basis containing boundary point 0. In addition, such transformation may judiciously be utilized to eliminate (up to quadratic) the singularity of the equation. The equation in the new variable has been subsequently transformed into a generalized matrix eigenvalue problem by approximating the new (unknown) function in an appropriate (truncated) basis comprising interpolating scale functions generated by scale functions in Daubechies family. The (interpolating wavelet-collocation) scheme developed here has been applied to some solvable and quasi-exactly solvable Sturm–Liouville problems in $\mathbb{R}^+$ appearing in quantum mechanical modeling in flat and curved spaces. It is observed that the approximation of eigenfunctions in the (compact support) interpolating wavelet basis obtained by using the collocation method can be reliably used to reveal a hidden spectrum of quasi-exactly solvable Sturm–Liouville problems in $\mathbb{R}^+$ with high accuracy.

KEYWORDS

Daubechies wavelets, interpolating wavelets, quasi-exactly solvable Sturm–Liouville problem, radial Schrödinger equation, wavelet collocation method

MSC CLASSIFICATION

65T60; 34B40; 34B60; 81-08; 81Q05; 81Q60; 41A99

1 | INTRODUCTION

Over the past few decades, a large deal of effort has been directed towards constructing physically significant quantum mechanical models for which the spectral problem associated with the Hamiltonian operator (both in nonrelativistic and relativistic cases) may not be exactly solvable. However, at least part of the spectrum can be obtained exactly employing algebraic or other methods.[1–11] This type of problems may be regarded as quasi-exactly solvable Sturm–Liouville problems (QESSLPs). Among several schemes for their construction and solution, the algebraic method was originated from the concept of spectrum generating algebra invented independently by three groups of mathematical/theoretical physicists, viz., Goshen and Lipkin in 1959[12] and Barut and Bohm[13] and Dothan et al[14] in 1965. Subsequently, this mathematical tool

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