MAHISHADAL RAJ COLLEGE

SESSION: 2021-2022

Total number of PUBLICATIONS in Journals: 30

(SCI/SCIE/SCOPUS-indexed/UGC care-listed: 22)

Faculty of Science

Journals (SCI/SCIE/SCOPUS/UGC-indexed)

1. Prasanta Dutta, Indadul Khan, Krishnendu Basuli, and **Manas Kumar Maiti**. "A modified ACO with K-OPT for restricted covering salesman problems in different environments." *Soft Computing* 26, no. 12 (2022): 5773-5803, https://doi.org/10.1007/s00500-022-06978-0, Electronic ISSN: 1433-7479, Print ISSN: 1432-7643.
2. Indadul Khan, **Manas Kumar Maiti**, and Krishnendu Basuli. "Multi-objective generalized traveling salesman problem: a decomposition approach." *Applied Intelligence* 52, no. 10 (2022): 11755-11783, https://doi.org/10.1007/s10489-021-02989-w, Electronic ISSN: 1573-7497, Print ISSN: 0924-669X.
3. Indadul Khan, **Manas Kumar Maiti**, and Krishnendu Basuli. "A random-permutation based GA for generalized traveling salesman problem in imprecise environments." *Evolutionary Intelligence* 16, no. 1 (2021): 229-245, https://doi.org/10.1007/s12065-021-00651-5, Electronic ISSN: 1864-5917, Print ISSN: 1864-5909.
4. Nilesh Pakhira and **Manas Kumar Maiti**. "A multi-item supply chain with multi-level trade credit policy under inflation: A mixed mode ABC approach." *Computers & Industrial Engineering* 159 (2021): 107412, https://doi.org/10.1016/j.cie.2021.107412, Online ISSN: 1879-0550, Print ISSN: 0360-8352.
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13. Anirbit Sengupta, **Anwesha Mukherjee**, Abhijit Das, and Debashis De. “AgriStick: An IoT-Enabled Agricultural Appliance to Measure Growth of Jackfruit Using 2-Axis JoyStick.” IEEE Instrumentation & Measurement Magazine 25, no. 3 (2022): 58-62, https://doi.org/10.1109/MIM.2022.9759351, Print ISSN: 1094-6969, Electronic ISSN: 1941-0123.
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Journals (Others)

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Faculty of Humanities & Social Science

Journals (UGC/Peer-reviewed)

25. **Asis De**. "Human/Non-human Interface and the Affective Uncanny in Amitav Ghosh's *Gun Island*," in ***RILE*** - *Revista Interdisciplinar de Literatura e Ecocritica* (English Edition), Vol. 1, No. 7, 2021, pp. 62-79. URL: http://asle-brasil.com/journal/index.php/aslebr/article/view/165/118
26. **Bivash Mistri**. Vaiśeṣiksutrer Āaṅgike Pratyakṣpramāṇer Prāmāṇya, Journal: ANVISA, ISSN: 0587-1646, VOL. XLI, PART -I, Jadavpur University, pp. 214-219.
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OPTIMIZATION

A modified ACO with K-Opt for restricted covering salesman problems in different environments

Prasanta Dutta[1] · **Indadul Khan**[2] · **Krishnendu Basuli**[3] · **Manas Kumar Maiti**[4]

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Abstract
In this study, the ant colony optimization (ACO) algorithm is modified with the K-Opt operation to solve the covering salesman problem (CSP) under one restriction in crisp and imprecise (fuzzy, rough) environments. A CSP involves two phases—the division of cities into groups with the selection of the visiting cities and searching of the Hamiltonian circuit through the visiting cities. But, none of the studies in the literature is made following the direct approach. Also, none of the studies in the literature gives attention to reduce the total travel distance of the unvisited cities from the visited city of a group. Moreover, there is no algorithm in the literature which provides the solution of a CSP with the specified coverage range r. Also, none has introduced any algorithm to solve CSPs in imprecise environments. Though algorithms are available to solve the Traveling Salesman Problems in the imprecise environments, the approach cannot deal with the problems involving fuzzy data with nonlinear membership functions or the problems involving rough data where the rough estimation can not be done using Lebesgue measure. The well-established algorithm for any routing problem is the ACO, but not much attention has been paid to solve the CSP using ACOs. To overcome these limitations on the studies of the ACO on the CSPs, here, an algorithm is proposed for the division of groups of the set of cities depending upon the maximum number of cities in a group and the total number of groups. Then, ACO is used to find the shortest/minimum-cost path of the problem by selecting only one visiting the city from each group without violating the restriction of the specified coverage range r of the location of the unvisited cities. K-Opt operation is applied periodically at the end of ACO operation to improve the quality of the best found solution so far by the ACO algorithm and to arrest any premature convergence. For the restricted problems, paths are searched in such a manner that the total distance/travel cost of different unvisited cities of a group from the visited city of the group should not exceed a predefined upper limit. To solve the problem in an imprecise environment, some approach is followed so that the tour is searched without transferring the imprecise optimisation problem into an equivalent crisp optimisation problem. Also, the simulation approaches in fuzzy and rough environments are proposed to deal with the CSPs with any type of estimation of the imprecise data set. Algorithm is tested with the standard benchmark crisp problems available in the literature. To test the algorithm in the imprecise environments, the imprecise instances are derived randomly from the standard crisp instances using a specified rule. Test results imply that the proposed algorithm is efficient enough in solving the CSPs in the crisp as well as in the imprecise environments.

Keywords Covering salesmen problem · Ant colony optimization · K-Opt operation · Fuzzy simulation · Rough simulation

1 Introduction

A covering salesman problem (CSP) is a complete weighted graph, consists of a set of vertices, called cities, and a weight matrix, called distance (cost) matrix which consists of the distance (travelling cost) between any two cities. The goal of the problem is to find the different clusters (groups) of the cities and then find a minimum cost Hamiltonian circuit visiting only one city in each cluster so that each unvisited city in a cluster should be located in a predefined cover-

✉ Indadul Khan
indadulkhan@gmail.com

[1] Debra Thana S.K.S MV, Gangaramchak, P.O. Chakshyampur, Paschim Medinipur, India

[2] Chandrakona Vidyasagar MV, Chandrakona Town, Paschim Medinipur, India

[3] West Bengal Sate University, Kolkata, India

[4] Mahishadal Raj College, Mahishadal, India

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Multi-objective generalized traveling salesman problem: A decomposition approach

Indadul Khan[1] · **Manas Kumar Maiti**[2] · **Krishnendu Basuli**[3]

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Abstract

Using the features of shuffle, re-generation, and 4-opt operation, a novel heuristic has been proposed based on the decomposition approach for the multi-objective generalized traveling salesman problems. A three-layer solution updating mechanism, namely, a shuffle layer, a layer for re-generation, and a layer for 4-opt operation, has been designed for the same. The shuffle and re-generation operations are specially designed to solve this problem. The shuffle operation is applied to a solution sequence (complete path/tour) to improve the corresponding objectives. The re-generation operation consists of two phases- in the first phase, the objectives are improved by interchanging a few portions of the groups/clusters sequence, and in the second phase, the same is done by replacing some cities from the corresponding groups. Finally, the solution and the corresponding groups are rearranged using the 4-opt operation for the betterment of the same. Problems with varying sizes from the generalized traveling salesman problem library are solved using the proposed approach to verify its performance and for the illustration. Some widely used performance metrics for multi-objective solution methodologies have been applied to the proposed heuristic to measure its performance. Various well-established heuristics have been modified according to this problem and are implemented to compare the efficiency of the proposed heuristic. Based on the performance metrics values of the computational outputs, a conclusion can be drawn that the proposed heuristic, named SR4-MOEA/D, is the best compared to the other heuristics implemented for the same. Also, every test instance of the proposed algorithm provides the best pareto optimal front, which is distributed over the whole true pareto front of the respective problem.

Keywords Multi-objective generalized traveling salesmen problem · Shuffle operation · Re-generation operation · 4-Opt operation · Decomposition approach on multi-objective heuristics

1 Introduction

A significant portion of the research work on NP-hard combinatorial optimization problems is captured by the Traveling Salesman Problem (TSP) due to its applicability in the areas of applied sciences [22]. An extension of TSP, the generalized traveling salesman problem (GTSP), was proposed by Henry-Labordere [1], Saksena [36], and Srivastava [40] in the 1960s and has received gradual attention in the social welfare services, like, rural health care, disaster management, rationing system, etc. A standard GTSP involves a node set that is divided into some disjoint subsets, and a weight is associated with each pair of nodes. The objective of the problem is to search a Hamiltonian circuit with minimum weight by visiting one and only one node of each subset. Normally, a node represents a destination or city, and weight represents the travel length between the two associated cities. So, a GTSP can be described as a complete weighted graph (V, E, W), where a member of $V = \{1, 2, .., N\}$ defines a destination/city, the member $e_{ij} \in E$ is associated with the destination i and the destination j indicates the path between the destination i and the destination j, the member $d_{ij} \in W = (d_{ij})_{N\times N}$ is associated with e_{ij} and indicates

✉ Indadul Khan
indadulkhan@gmail.com

Manas Kumar Maiti
manaskr1969@gmail.com

Krishnendu Basuli
krishnendu.basuli@gmail.com

[1] Department of Computer Science, Chandrakona Vidyasagar Mahavidyalaya, Paschim-Medinipur, West Bengal, 721201, India

[2] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal, 721628, India

[3] Department of Computer Science, West Bengal State University, Barasat, Kolkata, West Bengal, 700126, India

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RESEARCH PAPER

A random-permutation based GA for generalized traveling salesman problem in imprecise environments

Indadul Khan[1] · **Manas Kumar Maiti**[2] · **Krishnendu Basuli**[3]

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Abstract
A random-permutation technique and the features of the genetic algorithm (GA) are combined together to develop a novel heuristic for solving generalized travelling salesman problem. Here, the random-permutation technique is used to find the sequence of clusters of a probable solution in which a complete tour to be commenced. The features of GA are used to select the cities from different clusters of the sequence. The algorithm has the ability to solve the problems in both the crisp as well as in the imprecise environments. A fuzzy membership-based selection process is proposed to select a solution for the mating pool. A general comparison rule of the solutions is proposed to rank the potential solutions of the population in imprecise environments. In the crisp environment, the efficiency of the proposed approach is tested against a set of different benchmark test problems from GTSPLIB having sizes up to 226 cities with 26 clusters. It is observed from the experimental results that the algorithm produces 100% accurate results for all the benchmark test problems under consideration. Imprecise test problems are generated from different benchmark crisp test problems of TSPLIB and are used to test the algorithm in the imprecise environments. It is also observed from the experimental results that the proposed approach finds multiple optimal paths (i.e, more than one path), if exists, for the problems in the crisp as well as in the imprecise environments.

Keywords Traveling salesmen problem · Genetic algorithm · Randomness · Triangular fuzzy number · Rough set

1 Introduction

A generalized form of the classical Traveling Salesman Problem (TSP), the generalized TSP (GTSP) was introduced by Henry-Labordere [11], Saksena [31], and Srivastava [33] in the context of computer record balancing and of visit sequencing through welfare agencies in 1960s. The problem consists of a set of n cities and a cost matrix $(c_{ij})_{n\times n}$, where, c_{ij} is the cost of travelling from city i to city j. The n cities are grouped into several clusters- $cl_1, cl_2, \ldots, cl_k$, where k is the number of clusters. Every city must belongs to at least one cluster. So, a city may belongs to more than one clusters. A salesman starts from a city of a cluster, visits one and only one city of every cluster and returns to the starting city with the minimum expenditure. So, the goal of the problem is to find the path/route of the salesman with the minimum cost covering all the clusters exactly once. There are several real-life applications of GTSP, such as, mail delivery [17], welfare agency routing [31], material flow system design [17], vehicle routing [17], and computer file sequencing [11], etc. The GTSP belongs to the class of NP-hard problems.

In most of the above-mentioned studies it is implicitly assumed that the travel cost, c_{ij} between any two cities i and j, is fixed and crisp in nature. But c_{ij} depends on the several factors, like, the quality of the vehicle used, condition of the roadways, duration of the travel, weather condition, etc. The travelling cost between any two cites mainly depends on the quality of transport used for the purpose. Sometimes it depends on the availability of the vehicle, condition of the road ways, etc., though its value normally lies in an interval.

✉ Indadul Khan
indadulkhan@gmail.com

Manas Kumar Maiti
manasmaiti@yahoo.co.in

Krishnendu Basuli
krishnendu.basuli@gmail.com

[1] Department of Computer Science, Chandrakon Vidyasagar Mahavidyalaya, Paschim-Medinipur, West Bengal 721201, India

[2] Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba-Medinipur, West Bengal 721628, India

[3] Department of Computer Science, West Bengal State University, Barasat, Kolkata, West Bengal 700126, India

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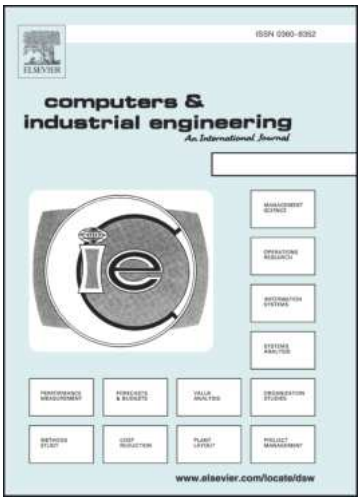

A multi-item supply chain with multi-level trade credit policy under inflation: A mixed mode ABC approach

Nilesh Pakhira, Manas Kumar Maiti

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A MULTI-ITEM SUPPLY CHAIN WITH MULTI-LEVEL TRADE CREDIT POLICY UNDER INFLATION: A MIXED MODE ABC APPROACH

Nilesh Pakhira[1], Manas Kumar Maiti[2]

[1]Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore, W.B. 721102, India
Email: npakhira1@yahoo.com (N. Pakhira)
[2]Department of Mathematics, Mahishadal Raj College, Mahishadal, Purba Medinipur, W.B. 721628, India
Email: manasmaiti@yahoo.co.in (M.K. Maiti)

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A MULTI-ITEM SUPPLY CHAIN WITH MULTI-LEVEL TRADE CREDIT POLICY UNDER INFLATION: A MIXED MODE ABC APPROACH

ABSTRACT. In this study, a multi-item supplier-wholesaler-retailer-customers supply chain with partial trade credit policy at each level under inflationary effect for a fixed planning horizon is developed and analysed. Here the wholesaler receives a partial credit period from the supplier, i.e., a credit period on a portion of the amount of units purchased. Wholesaler also offers a partial credit period to its retailer and in turn the retailer also offers a partial credit period to its customers to boost the base demand of any item. Here, credit period induced base demand of any item decreases linearly with time. Demand of the items are also influenced by the respective selling prices. The retailer introduces some promotional cost against advertisement and price discount to improve the demand of the items. Here, it is established that if the wholesaler shares a portion of this promotional cost then the profits of both the retailer and the wholesaler improve. Model is formulated as a mixed-integer profit maximization problem and is analysed in crisp as well as in imprecise (fuzzy/rough) environment and some managerial insights are outlined. To find the marketing decision of such a real-life supply chain model, here, a new variant of ABC is proposed for mixed-integer optimization problems. The algorithm is tested against a set of benchmark test problems available in the literature and its efficiency to solve such problems is well established.

Key words : Supply chain; Partial trade credit period; Inflation; Promotional cost sharing; Artificial Bee Colony.

1. Introduction

In any supply chain, profit of each party mostly depends on the market demand of the items involved in the chain, though, each party offers some sort of credit period to its purchaser to improve his/her sale amount. In reality, sale of each party mainly depends on the base demand of the item to the customers. This phenomenon as well as the credit opportunity from the wholesaler influences the retailer to offer some sort of credit facility to its customers. But the customers are basically floating in nature and there is no guarantee that all the customers will obey the business ethics. A portion of the customers may not pay the credit amount at the end of the credit period. This credit risk forces the retailer to offer only partial credit period to its customers, i.e., credit opportunity is offered on a portion of the amount purchased by any customer. On the other hand, to improve the demand, the retailer uses some promotional activities, like, local advertisement, offering price discount, free gift, etc., and the cost of these activities is known as the promotional cost. During the last decade, several research papers have been published reflecting

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A DETERIORATING FOOD PRESERVATION SUPPLY CHAIN MODEL WITH DOWNSTREAM DELAYED PAYMENT AND UPSTREAM PARTIAL PREPAYMENT

Prasanta Kumar Ghosh[1,4], Amalesh Kumar Manna[2], Jayanta Kumar Dey[3] and Samarjit Kar[1,*]

Abstract. This paper investigates a food supply chain model consisting of the supplier, food producer and multi-retailer of a deteriorating item under fully delay-in-payment and partial advance payment scheme. The deterioration rate of raw material is dependent on temperature and other environmental factors with respect to time. Here, the food producer prepares food after collecting the raw material from the supplier and then storing it in cold storage. The refrigeration cost is dependent on the occupied volume in the cold storage (where the products are preserved for freshness) and power consumption. The supplier offers delay-in-payment to stimulate the food producer to buy more raw material (which minimizes the holding cost and earns more revenues), whereas the food producer takes the partial advance payment on purchase cost from the retailers to ensure the order quantity. A mathematical model is developed to obtain optimal production time and the optimal number of deliveries so that the average profit of the food producer is maximum. Finally, a numerical example and sensitivity analysis of the key parameters are provided to illustrate and test the feasibility of the proposed model.

Mathematics Subject Classification. 90B05, 90B15, 90B25, 90B30, 90B50.

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1. Introduction

In this world, food deterioration is a common phenomenon in developing countries and may cause economic loss. In many countries, food supply chain management affronts a huge challenge of food quality, food safety, public health, demand, price variability and weather-related variability etc. On the other hand, perishable products are important in inventory management because customers strive for quality. According to Ferguson and Katzenberg [11], 15% (approximately) of foods deteriorates in the food retailing sector. Also, more than 25% of fruit and vegetables are deteriorated in China during transportation, at wholesale markets and in shops (*cf.* [22]). Food products are the most delicate goods on the market due to insufficient storage, the wrong

Keywords. Supply chain, deteriorating items, delay-in-payment, advance payment.

[1] Department of Mathematics, National Institute of Technology Durgapur, Durgapur 713209, India.
[2] Department of Mathematics, The University of Burdwan, Burdwan 713104, India.
[3] Department of Mathematics, Mahisadal Raj College, Mahisadal 721628, India.
[4] Department of Mathematics, Y.S. Palpara Mahavidyalaya, Purba Midnapore 721458, India.
*Corresponding author: kar_s_k@yahoo.com

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A Fuzzy Imperfect Production Inventory Model Based on Fuzzy Differential and Fuzzy Integral Method

Amalesh Kumar Manna [1,2], Leopoldo Eduardo Cárdenas-Barrón [3,*], Jayanta Kumar Dey [4], Shyamal Kumar Mondal [1], Ali Akbar Shaikh [2], Armando Céspedes-Mota [3] and Gerardo Treviño-Garza [3]

1 Department of Applied Mathematics with Oceanology and Computer Programming, Vidyasagar University, Midnapore 721102, India; akmanna1987@gmail.com (A.K.M.); shyamal_260180@yahoo.com (S.K.M.)
2 Department of Mathematics, The University of Burdwan, Burdwan 713104, India; aliashaikh@math.buruniv.ac.in
3 Tecnologico de Monterrey, School of Engineering and Sciences, Ave. Eugenio Garza Sada 2501, Monterrey, N.L., México 64849, Mexico; acespede@tec.mx (A.C.-M.); trevino@tec.mx (G.T.-G.)
4 Department of Mathematics, Mahishadal Raj College, Mahishadal 721628, India; dey_jaykum@yahoo.com
* Correspondence: lecarden@tec.mx

Abstract: In the inventory theory, to treat the uncertainty, the fuzzy set concept is used in order to provide a feasible approach to deal with the uncertainty problem. In this research work, a fuzzy economic production quantity model with interactive fuzzy demands is proposed. In a production process, in the beginning, the system is assumed to be in a controlled state in which only perfect items are manufactured. Later, the manufacturing production process shifts to be an out-of-control-state system; producing both perfect and imperfect items simultaneously, this is considered as a fuzzy state. The defective production rate is also taken into account as a fuzzy state. Here, the selection process of produced items is realized during the production period. With the aim of studying the practical feasibility of the fuzzy economic production inventory model along with a sensitivity analysis of some parameters, different numerical examples are illustrated.

Keywords: fuzzy economic production quantity; fuzzy imperfect production process; fuzzy integral method; fuzzy demand; fuzzy programming technique

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1. Introduction

It is well known that the fuzzy set concept is applied into the inventory models to treat the uncertainty. The fuzzy set theory was introduced by (Zadeh 1965) with the aim of providing a feasible approach to deal with the fuzzy uncertainty problem. In the literature, the fuzzy set theory, also known as uncertain sets, has attracted attention for treating uncertainty in a variety of circumstances. For example, fuzzy inventory costs in the economic order quantity model are used in (Park 1987; Priyan and Uthayakumar 2016). Obtaining the economic production quantity when the quantity of demand is uncertain is analyzed in (Chang 1999). To treat the inventory problem considering all the parameters and variables being fuzzy numbers, a fuzzy economic production model is established by (Chen and Hsieh 2000). Different types of production inventory models for fuzzy environments are proposed by studies such as (Dey et al. 2005; Hsieh 2002; Lee and Yao 1998; Lin and Yao 2000; Manna et al. 2014, 2017a). Furthermore, other, different research works solve uncertainty issues using fuzzy set theory, such as (Das et al. 2015; Soni and Joshi 2015). Bera and Jana (2017) developed an imperfect production inventory model for multi-items under bi-fuzzy environments. (Dey 2019) introduced an imperfect production inventory problem under a fuzzy random environment. Recently, (Maiti 2021) incorporated the demand-dependent production rate into an inventory model with imperfect production process under a cloudy fuzzy environment.

Traditional economic production quantity (EPQ) models assume that in manufacturing systems, all items are made of perfect quality. However, in the real world, due to many

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HIGHER-ORDER ANTIBUNCHING OF LIGHT IN SEVEN-PHOTON INTERACTION PROCESS

Nitu Sahu,[1,3] Samiran Kumar,[1,3] and Dilip Kumar Giri[4*]

[1] *Department of Education, Bokaro Steel City College Bokaro, Jharkhand, India*

[2] *Department of Physics, Mahishadal Raj College Mahishadal 721628, W.B., India*

[3] *University Department of Physics, Vinoba Bhave University Hazaribag, India*

[4] *University Department of Physics, Binod Bihari Mahto Koyalanchal University Dhanbad, India*

*Corresponding author e-mail: dilipkumargiri@gmail.com

Abstract

We study higher-order antibunching of light and the possibility of observing it in all modes in two and three-photon absorption seven-photon interaction processes. We solve the generalized interaction Hamiltonian for several particular cases in the Heisenberg picture and investigate the possibility of observing antibunching using the short-time approximation technique. We demonstrate that the antibunching of light in the initial pump field is directly dependent on coupling of the field between the modes and short-time interaction, as well as the quantity of photons. With the same number of photons, we find that the third-order antibunching is more prominent, followed by the second-and-first-order antibunching. In these systems, we discover that antibunching is not observed for the Stokes and signal modes in this process. We show that a higher-multiphoton-absorption technique is the best for producing optimum antibunched light.

Keywords: higher-order antibunching, seven-photon interaction process, photon number operator, short-time approximation.

1. Introduction

A nonclassical phenomenon [1,2], such as photon antibunching [3–12] of the field, is currently of great interest in the context of quantum teleportation [13, 14], quantum computation [15–19], and quantum cryptography [20–22], using a single-photon source as unconditional security [23–25]. Single-photon sources are light sources that emit light as single particles or photons and give rise to an effectively one-photon number state, i.e., the probability of emitting a single photon is larger than the probability of emitting two, three, four, or more photons simultaneously. The rate of simultaneous emission of two or more photons is lower in the antibunched state than it is in the single-photon state, indicating that the likelihood of detecting a single-photon source is larger than the probability of detecting a two or more-photon source in a bunch. Antibunching arises in pump modes, which lose energy, while bunching appears in signal modes, which absorb energy from the pump. In other words, as energy increases, more noise increases, and vice versa, as energy decreases, noise decreases [26–29].

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As a result, we found that a higher multiphoton absorption method is the best for producing optimum antibunched light.

6. Summary and Conclusions

In this paper, we investigated antibunching of light in two and three-photon absorption seven-photon interaction processes.

The quantity of pump photons and the coupling of the field between the modes and interaction time were demonstrated to be strongly related to the first, second, and third-order antibunching of light of the initial pump field. As a result, the maximum degree of antibunching that can be achieved is determined by the interaction time, which is limited by short interaction times. When comparing the first, second, and third-order antibunching of light, we deduced that the third-order antibunching had the most antibunching, followed by the second and first-order antibunching; all with the same amount of pump photons. Higher-order antibunching (photon number squared and photon number cubed) is thought to be more effective than ordinary antibunching in terms of achieving the depth of nonclassicality. We showed that the number of photons present in the pump mode appeared to be a good way to regulate the depth of nonclassicality.

It is inferred that in both two and three-photon absorption seven-photon interaction processes, ordinary and higher-order antibunching of light is absent for the Stokes mode over the pump mode and for the Stokes mode over the Stokes mode and the signal mode, respectively. We found that the three-photon absorption seven-photon interaction process had more antibunching than the two-photon absorption seven-photon interaction process, despite the fact that both processes had the same amount of photons. As a result, it is clear that a higher multiphoton absorption technique is the best for producing optimum antibunched light.

The findings of this paper are simple and straightforward to replicate in most physical systems in laboratories, paving the way for the experimental observation of higher-order antibunching and the development of suitable probabilistic single-photon sources for quantum teleportation and quantum cryptography. Finally, in addition to these important conceptual and foundational aspects, the realization of larger and better multiphoton nonclassical states should open up new possibilities and perspectives for quantum optic realizations of quantum information and communication processes, which are currently underexplored [39].

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A naphthalene-based azo armed molecular framework for selective sensing of Al^{3+}†

Subhabrata Mabhai,[abc] Malay Dolai,[d] Surya Kanta Dey,[e] Sujata Maiti Choudhury,[e] Bhriguram Das,[bf] Satyajit Dey,*[b] Atanu Jana*[g] and Deb Ranjan Banerjee*[c]

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An azo armed Schiff base chemosensor was synthesized based on a naphthalene fluorophore, which transduces greenish-yellow emission by complexing with Al^{3+}. It emits greenish-yellow fluorescence through restricted C=N isomerization, chelation-enhanced fluorescence, and the photo-induced electron transfer mechanism. The clear visible transformation of the achromatic ligand to a chromatic ligand by the 1 : 1 complexation with Al^{3+} is substantiated by ESI-MS spectra. ^{1}H NMR, ^{13}C NMR, and FTIR spectroscopies are used to characterize the **HL**. The selectivity of the **HL** for Al^{3+} in the presence of other metal ions was investigated through absorbance and fluorescence spectroscopies. The average lifetimes of **HL** and **L–Al^{3+}** have been evaluated using a time-resolved photoluminescence experiment to explore the sensing mechanism. The Al^{3+} sensing mechanism was also established by density functional theory calculations. A reversibility experiment was performed, demonstrating that Al^{3+} binding to **HL** is reversible. The pH variation on luminescence affirms that the **HL** can survive in physiological pH. Finally, the lower limit of detection of 5.4×10^{-7} and a good response in a cytotoxicity and cell imaging study confirm the usability of the ligand as an indelible signature of an effective biosensor for target Al^{3+}.

Introduction

In supramolecular chemistry, one of the challenging areas of development is developing a photochromic compound that can detect ions under the influence of external stimuli *via* photo-induced switching.[1] Although there are many analytical techniques for detecting ions, their operation demands skilled operators, high equipment costs, and complex preparatory processes.[2–6] A transition metal is an integral part of an enzyme that regulates biological activity, yet it can be detrimental to the environment and human life; thus, it is a real paradox of the environment.[7] Aluminium, when absorbed in our body from various sources such as aluminium-based utensils and medicines, circulates to almost all tissue, reaches plasma through iron-binding protein, and is stored in the brain. Alzheimer's disease due to aluminium-induced oxidative deterioration in the CNS (central nervous system) can happen even with a minimum dose of chronic exposure to aluminium from drinking water.[8] It is also believed to be the causative factor of smoking-related diseases, bone softening, chronic renal failure, and Parkinson's disease.[9] Therefore, to understand the mechanism of aluminium-induced adverse effects and to determine the concentration of Al^{3+} according to the WHO, researchers have been spurred to track aluminium more efficiently.[10] Because of their operational simplicity in detecting metal ions *via* chromogenic and fluorogenic sensing, chemosensors based on Schiff bases have piqued the interest of researchers in environmental and biomedical fields.[11] The most common mode of sensing operation in a chemosensor is that the photon interacting fluorophore site forms a communication with the receptor site after being attached with a metal ion and produces a 'turn-on' signal. Azomethine (CH=N) Schiff base derivatives armed with a suitable fluorophore moiety are considered classical ligands for detecting metal ions due to their elite coordination toward target metal ions, and ease of synthesis in combination with good photophysical properties.[12,13] A large number of sensory probes have been developed, taking

[a] *Department of Chemistry, Mahishadal Raj College, East Midnapore, Mahishadal, West Bengal, Pin No. 721628, India*
[b] *Department of Chemistry, Tamralipta Mahavidyalaya, East Midnapore, West Bengal, Pin No. 721636, India. E-mail: satyajitdeyoc@gmail.com*
[c] *Department of Chemistry, National Institute of Technology, Durgapur, WB, PIN-713209, India. E-mail: debranjan.banerjee@ch.nitdgp.ac.in*
[d] *Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur 721401, India*
[e] *Department of Human Physiology with Community Health; Vidyasagar University, Rangamati, Medinipur, West Bengal, Pin No. 721102, India*
[f] *Department of Chemistry, Vidyasagar University, Medinipur, West Bengal, Pin No. 721102, India*
[g] *Division of Physics and Semiconductor Science, Dongguk University, Seoul, 04620, South Korea. E-mail: atanujanaic@gmail.com*

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Multiple ion (Al^{3+}, Cr^{3+}, Fe^{3+}, and Cu^{2+}) sensing using a cell-compatible rhodamine-phenolphthalein-derived Schiff-base probe

Bhriguram Das [a,b], Avijit Ghosh [c], Dorothy Priyanka Dorairaj [d], Malay Dolai [e], Ramasamy Karvembu [d], Subhabrata Mabhai [f], Hyunsik Im [g], Satyajit Dey [b,*], Atanu Jana [g,*], Ajay Misra [a,*]

[a] Department of Chemistry, Vidyasagar University, Midnapore 721102, West Bengal, India
[b] Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur 721636, West Bengal, India
[c] Center for Research in Nanoscience and Nanotechnology, Technology Campus, University of Calcutta, Salt Lake, Kolkata 700106, West Bengal, India
[d] Dept. of Chemistry, National Institute of Technology, Tiruchirappalli 620015, India
[e] Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur 721404, India
[f] Department of Chemistry, Mahishadal Raj College, Mahishadal, Purba Medinipur 721628, India
[g] Division of Physics and Semiconductor Science, Dongguk University, Seoul 04620, South Korea

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ABSTRACT

In this study, a novel rhodamine-phenolphthalein derivative (**RBPF**) was designed, synthesized, and characterized. **RBPF** exhibited the selective and sensitive colorimetric detection of Cu^{2+} and Fe^{3+} and fluorometric detection of Al^{3+} and Cr^{3+}, thus functioning as a multiple-channel probe in MeOH-H_2O (v/v = 9/1, 5 μM HEPES, pH 7.2) in the presence of other cations. A strong enhancement of the absorbance at around 555 nm was observed for the four mentioned cations. In contrast, in the presence of Al^{3+} and Cr^{3+}, emissions were intensified within the red region of the spectra (583 and 586 nm, respectively). The **RBPF** sensor was found to bind to the metal ions at a 1:2 stoichiometric ratio. The proposed mechanism for the observed sensing behavior is the opening of the spirolactam ring of the rhodamine core in the presence of the four mentioned metal ions. The detection limits for Cu^{2+}, Fe^{3+}, Al^{3+}, and Cr^{3+} were calculated to be 1.21 μM, 1.75 μM, 2.27 μM, and 1.29 μM, respectively. To test the practical use of the probe, TLC-based paper strips were fabricated. In addition, cell-imaging analysis of Al^{3+} and Cr^{3+} ions in the A549 cancer cell line produced promising concentration and time-dependent detection results.

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1. Introduction

Ions are required for the development, growth, and functioning of living systems [1,2], but the presence of high levels of non-biodegradable ions can have deleterious effects [3]. For example, when the ion balance in living cells is disturbed, the electrolytic equilibrium is disrupted, individual organs can be damaged, and essential enzymatic mechanisms are affected. Trivalent cations, including Al^{3+}, Cr^{3+}, and Fe^{3+}, and divalent Cu^{2+} have a particularly strong impact on the body [4-7]. Al^{3+} is a common pollutant of drinking water and at high levels is toxic to humans in the long term. Aluminum damages the central nervous system (CNS) and is known to cause Alzheimer's disease, Parkinson's disease, neurodementia, encephalopathy, and breast cancer [8,9]. In contrast, Fe^{3+} plays several crucial roles in processes such as cellular metabolism and enzyme catalysis, including electron transfer reactions [10,11]. Fe^{3+} also conjointly transports oxygen within all tissues via haemoprotein [12,13]. However, Al^{3+} and Fe^{3+} interact competitively, and iron-binding proteins can transfer Al^{3+} to the brain and other organs, while the dysregulation of Fe^{3+} contributes to Huntington's disease [14,15]. In addition, although Cr^{3+} deficiency is not biologically detrimental, it increases the risk of diabetes, cardiovascular disease, and malignancy [16-18], while Cr toxicity in

Abbreviations: P, Phenolphthalein; R, Rhodamine B; PF, Phenolphthalein-dialdehyde; RBPF, Phenolphthalein-rhodamine dye derivative; WHO, World Health Organization; CNS, Central Nervous System; TLC, Thin layer chromatography; PET, Photoinduced electron transfer; ESIPT, Excited-state intramolecular proton transfer; HEPES, (4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid); LOD, Limit of detection; AIEE, Aggregation-induced emission enhancement; DFT, Density functional theory; TDDFT, Time-dependent density functional theory; EDTA, Ethelene diamnine tetraaetic acid; TCSPC, Time-correlated single-photon counting; MTT, Methyl thiazolyltetrazolium; FBS, Fetal bovine serum; DMEM, Dulbecco's Modified Eagle's Medium.

* Corresponding authors.
E-mail addresses: satyajitdeyoc@gmail.com, satyajit@tmv.ac.in (S. Dey), atanujanaic@gmail.com (A. Jana), ajay@mail.vidyasagar.ac.in, ajaymsr@yahoo.co.in (A. Misra).

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A cell-compatible phenolphthalein-aminophenol scaffold for Al^{3+}sensing assisted by CHEF phenomenon

Bhriguram Das[a,b], Avijit Ghosh[c], Sabina Yesmin[a,d], Sk Jahir Abbas[e], Malay Dolai[f], Subhabrata Mabhai[g], Atanu Jana[h,*], Satyajit Dey[b,*], Ajay Misra[a,*]

[a] Department of Chemistry, Vidyasagar University, Midnapore, West Bengal 721102, India
[b] Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur, West Bengal 721636, India
[c] Center for Research in Nanoscience and Nanotechnology, Technology Campus, University of Calcutta, Salt Lake, Kolkata, West Bengal 700106, India
[d] Department of Physics, National Dong Hwa University, Hualien 97410, Taiwan
[e] Department of Biliary-Pancreatic Surgery, Renji Hospital affiliated to Shanghai Jiao Tong University School of Medicine, Shanghai 200127, China
[f] Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur 721404, India
[g] Department of Chemistry, Mahishadal Raj College, Mahishadal, Purba Medinipur 721628, India
[h] Division of Physics and Semiconductor Science, Dongguk University, Seoul 04620, Republic of Korea

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ABSTRACT

Monitoring of excess Al^{3+} and its selective detection in biological and environmental samples are important tasks for researcher due to its harmful effects. Herein, we present a phenolphthalein-aminophenol derived sensor (**PFAP**) for the selective fluorescent response of Al^{3+} in an "OFF-ON" mode over a pool of analytes including eighteen cations with striking greenish emission. It has a prominent limit of detection (LOD) value (1.5 μM), fast response time (10 s) for Al^{3+} detection. The complexation properties of **PFAP** with Al^{3+} ions were clarified by UV–vis, ^{1}H & ^{13}C NMR, HRMS, and FTIR spectroscopic experiments. The recognition mechanism of **PFAP** for Al^{3+}working with chelation enhanced fluorescence (CHEF) and is verified with two model compounds **PF** and **PFAN** in the light of UV–vis, PL, TRPL, and NMR experiment. To check its applicability, easily prepared test paper and TLC strip of **PFAP** was produced for rapid and selective onsite detection of Al^{3+} ions. Bio-imaging application of **PFAP** in human lung cancer cell lines A549 demonstrated excellent results with negligible cytotoxicity and as an excellent marker to detect traces of Al^{3+} ion in a time-dependent as well as concentration-dependent manner. Actual sample analysis for Al^{3+} with the probe **PFAP** produces fruitful result.

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1. Introduction

The sensing and recognition of cationic analytes have attracted much attention due to their environmental and biological important role [1–3]. Aluminum is imperatively a significant ion which assumes to play essential role in biochemical processes [4]. It is regularly found in nature as silicate, hydroxide, sulfate, and cryolite. It has the biggest offer after iron on the planet's economy. However, high quantities of aluminum can generate a variety of biological and environmental issues [5]. Central nervous system, skeletal-muscle system, and hematopoietic framework may go through harmfulness with over exposure to aluminum [6]. Particularly, Alzheimer and Parkinson's dementia are the case of aluminum toxicity [5,7,8]. Aluminum-rich meals, foods stored in aluminum containers, drinking water, and pharmaceutical products are the most common dietary sources of aluminum. Potable water is one of the most major uses for aluminum [9]. According to the World Health Organization (WHO), aluminum compounds used in drinking water treatment should be used in moderation and should not surpass 0.2 ppm after treatment [10,11]. Accordingly, the foundation of new strategies for the fast, simple, and precise monitoring of Al^{3+} is profoundly significant for biological and ecological investigations.

Various methods such as titrimetry, voltammetry, chromatography, and electrochemistry have been developed for metal ions de-

LOD, Limit of detection; PET, Photoinduced elctron transfer; CHEF, Chelation enhanced fluorescence; ESIPT, Excited state intramolcular proton transfer; RET, Resonance energy transfer; ICT, Intermolecular charge transfer; AIE, Aggregation induced emission enhancement; WHO, World health organisation; HEPES, 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid; DFT, Density functional theory; TDDFT, Time-dependent density functional theory; TRPL, Time-resolved photoluminescence; TLC, Thin layer chromatography; BODIPY, 4,4-difluoro-4-bora-3a,4a-diaza-s-indacene.

* Corresponding author, A. Jana
E-mail addresses: atanujanaic@gmail.com (A. Jana), satyajitdeyoc@gmail.com (S. Dey), ajay@mail.vidyasagar.ac.in (A. Misra).

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Combined theoretical and experimental investigation of a DNA interactive poly-hydroxyl enamine tautomer exhibiting "turn on" sensing for Zn^{2+} in pseudo-aqueous medium†‡

Urmila Saha, §[a] Subhabrata Mabhai,¶[b] Bhriguram Das, ¶[c] Gopinatha Suresh Kumar, [a] Paula Brandão [d] and Malay Dolai *[e]

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Crystallographically established (solid state structure at 150 K temperature) enamine ligand 2-((1,3-dihydroxy-2-(hydroxymethyl)propan-2-ylamino)methyl)-4-bromo-6-methoxyphenol (**H_4L**) was prepared, which showed interconvertible equilibrium (ΔE = 7.37 kcal) of its tautomers and also found to exhibit DNA binding activity at the minor groove of double-stranded (ds) DNA. Spectroscopic and calorimetric methods were employed to explore the interaction of **H_4L** with DNA. Further, the competitive Hoechst 33258 displacement assay indicated the specific binding site of **H_4L** to be at the minor grooves of DNA. Thermodynamic evaluation from isothermal titration calorimetry (ITC) experiments suggested the association of **H_4L** with DNA to be an enthalpy driven process with an equilibrium binding affinity (K) of $(2.50 \pm 0.11) \times 10^4$ M^{-1}. Molecular docking studies were found to be in good agreement with the experimental results of the DNA interaction of the probe in groove binding mode. The poor emission of **H_4L** in the excited state was due to excited state induced proton transfer (ESIPT), but in the presence of Zn^{2+}, the ESIPT was blocked an chelation-enhanced fluorescence (CHEF) was initiated to exhibit 'turn on' fluorescence upon the coordination of Zn^{2+}. The **H_4L** probe was found to detect Zn^{2+} selectively among various metal ions and the LOD was calculated to be ~1.13 μM. The coordination of the Zn(II) bound complex and the relative stability of the tautomers of **H_4L** were investigated in detail *via* spectroscopic and computational studies.

Introduction

As a well-established phenomenon, the Schiff bases prepared from salicylaldehydes and aromatic/aliphatic amines exist in different tautomeric forms, *i.e.*, (i) enamine or keto tautomer[1] (ii) imine or enol[2] and (iii) zwitterionic forms.[3] However, it is very difficult to consider the particular structures of Schiff base adducts where they may exist in the enamine form in the solid state and convert to the imine form in the solution state, although the complication in assessing tautomeric structures can be removed by knowing the exact structures of the compounds. Many research studies have involved determining the structures of the same compounds in recent years using ^{15}N and ^{13}C solid-state nuclear magnetic resonance (NMR) spectroscopy.[4] However, the phase-to-phase inter-conversion of structures is so rapid that it cannot be unequivocally determined in this way. Moreover, single-crystal X-ray structures can give an accurate solution to the puzzling problems in the solid state. Again, there is a possibility of the temperature-dependent interconversion of tautomers in the solid state, known as thermochromism,[5] which adds some extra complications in perfectly assigning structures in this context.

[a] *Organic and Medicinal Chemistry Division, CSIR-Indian Institute of Chemical Biology, 4, Raja S.C. Mullick Road, Kolkata 700 032, W.B., India*
[b] *Department of Chemistry, Mahishadal Raj College, Purba Medinipur 721628, W.B., India*
[c] *Department of Chemistry, Vidyasagar University, Paschim Medinipur 721102, W. B., India*
[d] *Department of Chemistry, CICECO-Aveiro Institute of Materials, University of Aveiro, 3810-193 Aveiro, Portugal*
[e] *Department of Chemistry, Prabhat Kumar College, Purba Medinipur 721404, W.B., India. E-mail: dolaimalay@yahoo.in*

† Dedicated to Professor Ashutosh Ghosh, University of Calcutta on the Occasion of his 62nd birthday.

‡ Electronic supplementary information (ESI) available: The supporting Information includes further synthetic details, experimental details including DFT calculations and information concerning X-ray structure analysis, ^{1}H-NMR spectra, IR spectra and other physical properties studies. CCDC 2092531. For ESI and crystallographic data in CIF or other electronic format see DOI: 10.1039/d1nj03510j

§ Current address: Department of Chemistry, Presidency University, 86/1 College Street, Kolkata 700073, India.

¶ Authors contributed equally towards the physical measurements.

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Analytical Methods

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A bio-compatible pyridine–pyrazole hydrazide based compartmental receptor for Al^{3+} sensing and its application in cell imaging†

Bhriguram Das, [ab] Malay Dolai, [c] Avijit Ghosh, [d] Anamika Dhara,[e] Ananya Das Mahapatra,[f] Debprasad Chattopadhyay,[fg] Subhabrata Mabhai,[h] Atanu Jana, *[i] Satyajit Dey *[b] and Ajay Misra *[a]

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For practical applications, the development of bio-compatible organic molecules as p-block ion chemosensors is critical. Herein, we report the single crystal (SC) of new pyridine–pyrazole derived Al^{3+} sensor **H_2PPC** [(*Z*)-*N*'-(2,3-dihydroxybenzylidene)-5-methyl-1-(pyridin-2-yl)-1*H*-pyrazole-3-carbohydrazide] as well as its Cu-complex SC. The probe exhibits an "off–on" fluorescence response towards Al^{3+} ions, and this has been modulated with different solvents. For selective detection of Al^{3+} ions, a special coordination pocket in the structural backbone is advantageous. The chemosensor exhibits a submicromolar detection level (LOD = 4.78 μM) for Al^{3+}. The density functional theory (DFT) and time-dependent DFT (TD-DFT) calculations of **H_2PPC** and **$[Al(HPP)_2]^+$ (1)** reveal that a change of the structural conformation of probe **H_2PPC** upon complexation causes the pyrazole and pyridine units to create a specific cavity to tether Al^{3+}, and consequently **H_2PPC** proves to be a promising molecule for Al^{3+} detection. Furthermore, the probe has been successfully used to evaluate Al^{3+} as a low-cost kit using filter paper strips, and the *in situ* Al^{3+} ion imaging in Vero cells as well as A549 cell lines shows the sensor's nuclear envelope penetrability, indicating that it has great potential for biological and environmental applications.

1. Introduction

Aluminum compounds are used in various items, including household appliances, construction materials, transportation systems, and communication, and advanced medical devices.[1] Aluminum has a high level of exposure due to its widespread use in everyday life. Aluminum is well-known to be highly harmful to human health as well as the plant kingdom.[2,3] Because of the possible connection to the brain, doctors refer to Al^{3+} as the "silent killer" in the human body. Dementia, myopathy, Alzheimer's disease, and Parkinson's disease are all neurodegenerative disorders caused by it.[4–8] Overexposure to aluminum dust has a detrimental effect on dialysis encephalopathy, lung functions, tumors, cough, and asthma in industry staff.[9] Due to aluminum toxicity, studies on aluminum (Al^{3+}) detection are crucial for controlling its concentration levels in the biosphere and have attracted more attention from researchers. In this context, sensitive and dependable fluorescent molecular sensors appear to be the most appropriate tool, as they have advantages in terms of selectivity, sensitivity, response time, and cost, and thus have piqued the interest of chemists.[10–12] The non-transition metal ion Al^{3+} lacks spectroscopic characteristics because it lacks d electrons. As a result, the d–d electronic transition for colorful, complex generation is an ambiguous way to detect Al^{3+} ions with the naked eye. Instead, an alternative route involving appropriate ligand design that results in a successful LMCT (ligand–metal charge transfer) will solve the problem. To fit the coordination preferences of the metal ion, suitable donor atoms should be positioned at strategic positions in the ligand cavity. It should be noted that, in comparison to other transition metal ions, Al^{3+}

[a]*Department of Chemistry, Vidyasagar University, Midnapore, 721102, West Bengal, India. E-mail: ajay@mail.vidyasagar.ac.in; ajaymsr@yahoo.co.in; Fax: +91 3222 275329*

[b]*Department of Chemistry, Tamralipta Mahavidyalaya, Purba Medinipur, 721636, India. E-mail: satyajitdeyoc@gmail.com*

[c]*Department of Chemistry, Prabhat Kumar College, Contai, Purba Medinipur, 721404, West Bengal, India*

[d]*Center for Research in Nanoscience and Nanotechnology, University of Calcutta, Technology Campus, Salt Lake, Kolkata 700106, India*

[e]*Department of Chemistry, Hiralal Mazumdar Memorial College for Women, Dakshineswar, North 24 Parganas, Kolkata 700035, India*

[f]*ICMR-Virus Unit, ID & BG Hospital Campus, 57 Dr Suresh C Banerjee Road, Beliaghata, Kolkata 700010, India*

[g]*ICMR-National Institute of Traditional Medicine, Nehru Nagar, Belagavi 59001, Karnataka, India*

[h]*Department of Chemistry, Mahishadal Raj College, Purba Medinipur, 721628, India*

[i]*Division of Physics and Semiconductor Science, Dongguk University, Seoul, 04620, South Korea. E-mail: atanujanaic@gmail.com*

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AgriStick: An IoT-Enabled Agricultural Appliance to Measure Growth of Jackfruit Using 2-Axis JoyStick

Anirbit Sengupta, Anwesha Mukherjee, Abhijit Das, and Debashis De

In the field of agriculture, growth monitoring and measurement are two important factors used specifically to evaluate the influence of the environmental conditions on productivity. The change of circumference of parts of plants like their trunks, branches and fruits is one way to monitor plant growth. In this paper, we developed an Internet of Things (IoT)-based growth measurement and monitoring system using a 2-Axis joystick. In the case study, we measured the growth of Jackfruit which is a tropical fruit and widely cultivated in tropical areas like India, Bangladesh, Thailand, Brazil, and Malaysia**.** The developed appliance is referred to as *AgriStick*. The IoT appliance utilizes a 16-bit ultra-low power consuming microcontroller. We used RS485 protocol to make our appliance work for long distance range. The sensor was utilized for the purpose of monitoring the growth of horticulture crops as well as natural ecosystem plants.

Measuring Agricultural Indicators

Real-time information collection and analysis are essential in recent agricultural systems to properly use fertilizer, pesticide, water, etc. The growth rate monitoring or growth measurement is a significant attribute of the horticulture and regular ecosystem. The crop growth depends on various factors like environmental and physiological conditions and a plant's genetic endowment. The growth monitoring is significant for timely harvesting of crops for better yield, from the economical perspective of the farmers. We generally use the radius-wise growth of stems or tree branches as pointers of the vigor of a plant, while the growth of fruit gives us an essential functional factor in gardening production. Usually, in growth measurement, strain gauges and Linear Variable Differential Transformers (LVDT) are used [1]. Though the LVDT-based systems are more expensive than the strain gauge-based systems, the former provide information with better accuracy and resolution.

The storage of growth-related information is also vital for analysis. In [2], multispectral images were collected for higher output phenotyping of tomato spot wither disease confrontation among 20 peanut genotypes. For growth measurement of tree parts and fruits, there are tools like dendrometers [3], [4]. Though they offer benefits such as temperature compensation and fine resolution, there are few disadvantages such as cost, large size, and additional support required for the sensors, and recalibration of the sensor when moved from one tree to another. The disadvantages led to the development of an alternative sensor which is an optoelectronic sensor-based measurement tool [5]. Practically, this appliance is cost-effective and has proven as an alternative solution for growth measurement. Our research is based on the development of an IoT-based appliance that can perform the monitoring and measurement in an adjusting manner for both remote places and test areas using the Internet.

The authors in [6] have highlighted the use of IoT in smart precision agriculture and farming. The researchers have proposed in [7], an IoT device for monitoring fruit growth. In [8], the authors have discussed the application of Radio Frequency Identification sensing technology in environmental monitoring, soil monitoring, plant growth monitoring, and harvest quality monitoring. The use of IoT in growth monitoring has several advantages, such as the surveillance is continuous even in real-time, and the data fetched through the sensor node can be stored in the cloud for future use. Growth monitoring of crops is a significant area of research interest in the field of smart agriculture. In [9], the authors have developed a system to monitor the growth of apple plantations. In that work, the authors have used a deep learning-based edge network, and performed the remote estimation of apple size during the entire growth period.

The existing growth measurement systems [1], [5] used the mouse or sensor as the sensing unit, Bluetooth as the communication protocol, and stored the collected data inside the SD card. However, there are two major issues: Bluetooth provides short-distance communication, and the SD card is not able to contain a huge volume of data. To deal with these challenges, a system is required that will be able to provide comparatively long-distance communication, and can store high volume of data for further analysis. In this paper, we propose an IoT-based growth measurement system named as *AgriStick*, that

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the cloud. This will help to reduce the network traffic and storage overhead of the cloud. Blockchain plays an important role in agriculture and food supply chain management [12] and is especially for security purposes. In our system, we also could use blockchain for security purposes and in crop supply chain management. Therefore, the use of blockchain is another future research scope of AgriStick.

Conclusions

We developed the Internet of Growth Measuring Things – AgriStick using a 2-Axis joystick and used it to measure and monitor the growth of Jackfruit. We installed the developed sensor node in the field for 24 days, during which time, the sensor node showed good performance, indicated with high accuracy of ~99%, with low power consumption and battery life of approximately two months. We use this IoT appliance for monitoring and measurement of the radial growth of plants in the agricultural industry. The system will give a new dimension to the modern-day IoT-based precision agriculture. The developed system will help to understand the right time to harvest the fruit from the tree, depending upon the radial growth data analysis.

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Anirbit Sengupta (anirbit87sengupta@gmail.com) is pursuing a Ph.D. degree from Maulana Abul Kalam Azad University of Technology in West Bengal, India and is an Assistant Professor in the Department of Electronics and Communication Engineering at the Dr. Sudhir Chandra Sur Institute of Technology and Sports Complex, Kolkata. His research areas are IoT, cloud computing, AI, embedded systems and sensors.

Anwesha Mukherjee (anweshamukherjee2011@gmail.com) is an Assistant Professor and Head of the Department of Computer Science at Mahishadal Raj College, Mahishadal, Purba Medinipur, West Bengal, India. Her research areas include IoT, mobile cloud computing, edge computing, and green mobile networks.

Abhijit Das (ayideep@yahoo.co.in) is an Associate Professor in the Department of IT, RCC Institute of Information Technology, Kolkata, India. His current research topics include IoT, e-waste management, data science, quantum computing, and object-oriented categorization.

Debashis De (debashis.de@makautwb.ac.in) is a Professor ~~of~~ the Department of Computer Science and Engineering, and Director of School of Computational Science of the Maulana Abul Kalam Azad University of Technology in West Bengal, India and Adjunct Research Fellow at the University of Western Australia, Australia. His research interests include mobile edge computing and IoT.

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S.I. : MULTIFACETED INTELLIGENT COMPUTING SYSTEMS (MICS)

STROVE: spatial data infrastructure enabled cloud–fog–edge computing framework for combating COVID-19 pandemic

Shreya Ghosh[1,2] · **Anwesha Mukherjee**[3]

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Abstract
The outbreak of 2019 novel coronavirus (COVID-19) has triggered unprecedented challenges and put the whole world in a parlous condition. The impacts of COVID-19 is a matter of grave concern in terms of fatality rate, socio-economical condition, health infrastructure. It is obvious that only pharmaceutical solutions (vaccine) cannot eradicate this pandemic completely, and effective strategies regarding lockdown measures, restricted mobility, emergency services to users—in brief data-driven decision system is of utmost importance. This necessitates an efficient data analytics framework, data infrastructure to store, manage pandemic related information, and distributed computing platform to support such data-driven operations. In the past few decades, Internet of Things-based devices and applications have emerged significantly in various sectors including healthcare and time-critical applications. To be specific, health-sensors help to accumulate health-related parameters at different time-instances of a day, the movement sensors keep track of mobility traces of the user, and helps to assist them in varied conditions. The smartphones are equipped with several such sensors and the ability of low-cost connected sensors to cover large areas makes it the most useful component to combat pandemics such as COVID-19. However, analysing and managing the huge amount of data generated by these sensors is a big challenge. In this paper we have proposed a unified framework which has three major components: (i) Spatial Data Infrastructure to manage, store, analyse and share spatio-temporal information with stakeholders efficiently, (ii) Cloud–Fog–Edge-based hierarchical architecture to support preliminary diagnosis, monitoring patients' mobility, health parameters and activities while they are in quarantine or home-based treatment, and (iii) Assisting users in varied emergency situation leveraging efficient data-driven techniques at low-latency and energy consumption. The mobility data analytics along with SDI is required to interpret the movement dynamics of the region and correlate with COVID-19 hotspots. Further, Cloud–Fog–Edge-based system architecture is required to provision healthcare services efficiently and in timely manner. The proposed framework yields encouraging results in taking decisions based on the COVID-19 context and assisting users effectively by enhancing accuracy of detecting suspected infected people by ∼24% and reducing delay by ∼55% compared to cloud-only system.

Keywords Health service provisioning · Health data analysis · Cloud–Fog–Edge framework · COVID-19

1 Introduction

The widespread of infectious coronavirus disease (COVID-19) due to Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus has affected more than 150 million people (positive case) and resulting over 35,00,000 deaths all over the world (as of last week of May, 2021). This pandemic has brought substantial changes in all aspects of our lifestyle. The healthcare sector of all countries were significantly affected and several strategies such as restricted mobility, isolating regions, lockdown measures have been adapted. All though these measures have reduced the spread of the disease, however, there is a great impact on socio-

✉ Shreya Ghosh
shreya.cst@gmail.com; spg5897@psu.edu

Anwesha Mukherjee
anweshamukherjee2011@gmail.com

[1] Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, Kharagpur, India

[2] College of Information Sciences and Technology, The Pennsylvania State University, State College, USA

[3] Department of Computer Science, Mahishadal Raj College, Mahishadal, West Bengal, India

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LETTER

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OrangeMusic: An orange computing-inspired recommender framework in internet of music things

Samarjit Roy[1] | **Anwesha Mukherjee**[2] | **Debashis De**[1,3]

[1]Centre for Mobile Cloud Computing (CMCC), Dept. of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal (formerly, West Bengal University of Technology), Salt Lake City, Kolkata, India

[2]Dept. of Computer Science, Mahishadal Raj College, Purba Medinipur, West Bengal, India

[3]University of Western Australia, Crawley, Western Australia, Australia

Correspondence
Samarjit Roy, Centre for Mobile Cloud Computing (CMCC), Dept. of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal (formerly, West Bengal University of Technology), BF-142, Sector-I, Salt Lake City, Kolkata-700064, West Bengal, India.
Email: samarjit.tech89@gmail.com

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Abstract

Recent computational analytics in the domain of the Internet of Things provides crowd-sourced reviews for decision assistance for innumerable aspects of our living standards and socio-entertainments. However, one of the most significant tasks for obtainable online music libraries and websites is the demand for personalized and professionalized courses of action for music listeners and composers to elect suitable musical performances. In this paper, we illustrate a hybrid matrix factorization-based content-sensitive music recommender schema on the Internet of Music Things. Emerging orange computing technology offers a harmonic fusion framework for psychological care and happiness-concerned computing. We elucidate the projected music recommender paradigm in the domain of Internet of Music Things, titled as OrangeMusic. The OrangeMusic schema differs from the earlier contributions in the following aspects: (a) Orange computing-based information fusion framework is applied on the Internet of Music Things; (b) Provided musical content revisions can be exposed by listeners' rating metrics and be exploited to amend original listener-provided ratings; (c) Music listeners' preferences and musical items are incorporated into the standard matrix factorization mechanism. The performance metrics flourish that our proposed OrangeMusic presents a proficient rating prediction and intensifies the accuracy of content-sensitive music recommendation expressively.

KEYWORDS

hybrid matrix factorization, internet of music things, music recommender system, Orange computing

1 | INTRODUCTION

Musicians can compose knowledge-based music for listeners and can circulate worldwide through Internet-driven live-streamed performances. Internet of Things (IoT) in Music has provided an evolving schema that enables remotely accessible musicians, multiple instruments, and music-making technologies into a solitary platform. In,[1] the authors have provided the opportunistic crowdsensing-oriented Internet of Music Things (IoMT) system architecture and evaluated the system performances in terms of the time for data transmission, power dissipation, and energy consumption. IoMT has been elucidated in diverge contexts to fix music composition and generation perspectives, such as ubiquitous music retrieval, remote performance monitoring, and auto-tuning of musical instruments. Acceptance of the IoT-inspired musical performances depends on the audiences: how they feel according to their present emotion and recommend to the future listeners.[2,3]

Numerous strategies exist for movies recommendation, product recommendations, etc. In,[4] the authors illustrated an Ensemble-based system with the Particle Swarm Optimization that boosts towards intelligent recommendation frameworks. In,[5] emerging Capsule Network and

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of EVS, MAE, and RMSE. The OrangeMusic has conceivable applications in the real world which comprise the wide-network interactive and distributed music performances, wearable smart instruments, dynamic rhythmic tuning, and multi-user-based virtual music composition and reconstruction systems. As Orange computing refers to a humanistic care-inspired framework, the association of Orange computing and Internet of Music Things, that is, OrangeMusic has the potential impacts on the music-therapeutic applications. Music therapy is yet unscathed by the emerging technologies of OrangeMusic. However, this schema recommends impressive capability for the devices that may perhaps be concerned with the assistive-living consequences that offer a non-invasive, individually accustomed, outline of psychological and humanistic treatment which is forever accessible. In future work, we shall try to incorporate multifaceted multiple intelligent computing strategies to enhance the music recommendation efficiency and to design more humanized and personalized humanistic care frameworks in the contexts of the IoT and Orange technology convergence.

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The data that support the findings of this study are openly available in Mendeley at https://doi.org/10.17632/9v76rdd4gz.2.

ORCID

Samarjit Roy https://orcid.org/0000-0002-7874-8348

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RESEARCH ARTICLE

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RESCUE: Enabling green healthcare services using integrated IoT-edge-fog-cloud computing environments

Jaydeep Das[1,2] | **Shreya Ghosh**[3,4] | **Anwesha Mukherjee**[5] | **Soumya K. Ghosh**[3] | **Rajkumar Buyya**[6]

[1]Advanced Technology Development Centre, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal, India

[2]School of Computer Engineering, KIIT Deemed to be University, Bhubaneswar, Odisha, India

[3]Department of Computer Science and Engineering, Indian Institute of Technology, Kharagpur, West Bengal, India

[4]College of Information Sciences and Technology, The Pennsylvania State University, State College, Pennsylvania, USA

[5]Department of Computer Science, Mahishadal Raj College, Garh Kamalpur, Mahishadal, West Bengal, India

[6]School of Computing and Information Systems, The University of Melbourne, Victoria, Melbourne, Australia

Correspondence
Jaydeep Das, Advanced Technology Development Centre, Indian Institute of Technology Kharagpur, Kharagpur, West Bengal 721302, India.
Email: jaydeep@iitkgp.ac.in

Abstract

Internet of Things (IoT) has a pivotal role in developing intelligent and computational solutions to facilitate varied real-life applications. To execute high-end computations and data analytics, IoT and cloud-based solutions play the most significant role. However, frequent communication with long distant cloud servers is not a delay-aware and energy-efficient solution while providing time-critical applications such as healthcare. This article explores the possibilities and opportunities of integrating cloud technology with fog and edge-based computing to provide healthcare services to users in exigency. Here, we propose an end-to-end framework named *RESCUE* (enabling green healthcare services using integrated iot-edge-fog-cloud computing environments), consisting efficient spatio-temporal data analytics module for efficient information sharing, spatio-temporal data analysis to predict the path for users to reach the destination (healthcare center or relief camps) with minimum delay in the time of exigency (say, natural disaster). This module analyzes the collected information through crowd-sourcing and assists the user by extracting optimal path post-disaster when many regions are nonreachable. Our work is different from the existing literature in varied aspects: it analyses the context and semantics by augmenting real-time volunteered geographical information (VGI) and refines it. Furthermore, the novel path prediction module incorporates such VGI instances and predicts routes in emergencies avoiding all possible risks. Also, the design of development of a latency-aware, power-aware data-driven analytics system helps to resolve any spatio-temporal query more efficiently compared to the existing works for any time-critical application. The experimental and simulation results outperform the baselines in terms of accuracy, delay, and power consumption.

KEYWORDS

cloud computing, edge computing, geospatial query processing, green computing, healthcare service, internet of things, spatio-temporal data

Jaydeep Das and Shreya Ghosh contributed equally to this study.

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Femtolet Based Low Power Hetnet Using Soft Fractional Frequency Reuse

Anwesha Mukherjee[1] · **Priti Deb**[2] · **Debashis De**[2,3]

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Abstract
This paper addresses three prime issues of fifth generation mobile network: frequency allocation, power efficiency and communication while computing. This paper proposes a power-efficient micro-femtolet/macro-femtolet network based on soft fractional frequency reuse. Macrocell/microcell base stations are used in the network, and for providing good signal strength and offloading facilities to indoor and edge region users' femtolets are allocated inside the macrocell/microcell. The power transmission in the proposed heterogeneous network (HetNet) is estimated. The analytical evaluation presents that use of SFFR reduces the power transmission of the network by 10.87% approximately. This is also observed that the signal-to-interference-plus-noise ratio (SINR) of the network is improved using the proposed strategy. For experimental evaluation we have used vector signal generator (VSG) and vector signal analyzer (VSA). The simulation analyses performed using network simulator Qualnet shows that femtolet provides ∼(2–34)% reduction in energy consumption than the cloud based offloading.

Keywords Soft fractional frequency reuse · Femtolet based HetNet · Power reduction · SINR improvement

✉ Debashis De
dr.debashis.de@gmail.com

Anwesha Mukherjee
anweshamukherjee2011@gmail.com

Priti Deb
pritidb@gmail.com

[1] Department of Computer Science, Mahishadal Raj College, Mahishadal, West Bengal 721628, India

[2] Department of Computer Science and Engineering, Maulana Abul Kalam Azad University of Technology, West Bengal, B.F.-142, Sector-I, Salt Lake, Kolkata, West Bengal 700064, India

[3] Department of Physics, University of Western Australia, 35 Stirling Hwy, Crawley, WA 6009, Australia

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Anwesha Mukherjee is working as an Assistant Professor and Head of the Department of Computer Science in Mahishadal Raj College, West Bengal, India. She has received her Ph.D. degree and M. Tech (Gold Medalist) degree from West Bengal University of Technology (presently known as Maulana Abul Kalam Azad University of Technology, West Bengal) in 2018 and 2011 respectively. She has received Young Scientist award from International Union of Radio Science, H. Q., Belgium in 2014 in Beijing, China, in 2020 and in 2021. She has worked as a Research Associate in the Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur. She received DST-INSPIRE fellowship from Department of Science and Technology, Govt. of India to pursue her Ph.D. Her research interest includes development of green mobile network and geospatial mobile cloud computing.

Priti Deb has received her M. Tech degree from Maulana Abul Kalam Azad University of Technology in 2015. She is presently pursuing her Ph.D. in the field of mobile network. She has received Young Scientist award from International Union of Radio Science, H. Q., Belgium in 2021. Her research interest includes Power Optimization in 5G Mobile Network.

Debashis De is Professor Department of Computer Science and Engineering & Director of School of Computational Science of MAKAUT, WB, India, and Adjunct research fellow, University of Western Australia, Australia. He is Senior Member-IEEE, Fellow IETE, Secretary, CSI Kol. He was awarded the prestigious Boyscast Fellowship by the Department of Science and Technology, Government of India, to work at the Herriot-Watt University, Scotland, UK. He received the Endeavour Fellowship Award from 2008-2009 by DEST Australia to work at the University of Western Australia. He received the Young Scientist award both in 2005 at New Delhi and in 2011 in Istanbul, Turkey, from the International Union of Radio Science, Belgium. In 2016 he received JC Bose research award by IETE, New Delhi. In 2019 he received Siksha Ranta Award by the Govt. of West Bengal. He developed the Centre of mobile cloud computing for IoT. He published in 300 journals and 100 conference papers,12 books, and filed 9 patents. His h index is 31, citation 4600.

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GrowFruit: An IoT based Radial **Grow**th Rate Monitoring Device for **Fruit**

Anirbit Sengupta
Maulana Abul Kalam Azad University of Technology

Anwesha Mukherjee
Mahishadal Raj College

Abhijit Das
RCC Institute of Information Technology

Debashis De
Maulana Abul Kalam Azad University of Technology

***Abstract*—*GrowFruit* is an Internet of Things (IoT)-based low-cost real-time radial growth-rate measurement device for fruit or stem. The working principle is measuring the growth of multiple crops up to 128 different inputs utilizing a single Texas Instrument-based 32-bit ultra-low-power microcontroller. The system utilizes Flex sensors, each of 4.5 inches to measure the change of circumference of the crop. The bending angle of the Flex sensor generates voltage, and via Analog to Digital Converter (ADC), is fed to the microcontroller in the form of a digital signal. With the help of the Quectel M95 GSM modem, the microcontroller sends the signal to the cloud for storage and analysis of the growth rate data. As the system measures the perimeter changes of fruits or stems, more precise growth information is obtained.**

I. Introduction

The recent agricultural aspects require a real-time crop growth rate monitoring system. The crop growth rate depends on various factors such as the plant's genetic endowment and physiological and environmental conditions. The growth rate monitoring is an essential factor in plant studies for horticulture and natural ecosystem-grown crops. The growth measuring systems usually are supported by direct contact with the test sample and the mechanical structure that has to be updated depending on the size and shape of the sample [1]. In the growth measurement systems, Linear Variable Differential Transformers (LVDT) and strain gauges are used [1]. The strain gauge-based systems are economical compared to the LVDT-based systems. However, the LVDT-based systems provide precise, accurate, and high-resolution information regarding growth rate, whereas in strain gauge-based systems, specific electronic circuitry and flexible frames are required. The crop growth-related information storage is also significant for proper monitoring. This paper aims to design a device that will collect growth-related information and store the collected data for better growth monitoring. Our research work has designed an IoT-based device that utilizes a 32-bit ultra-low-power-consuming microcontroller that will process up to 128 inputs. The device utilizes the RS485 protocol for long-distance communication. We have used 4.5-inch Flex sensors to monitor the growth of horticulture crops and natural ecosystem plants. The bending angle of the Flex sensor, which has an analog output, is fed to the microcontroller via ADC for processing the data. Our system stores the processed data inside the EPROM and, after every one hour, sends the data to the cloud using the Quectel M95 GSM modem and the Rest API protocol. We plot the data in the X-Y plane in the form of the day and circumference of the crop, trunk, or branches, measured using the sensor. The proposed system obtains the sleep mode through Real-Time Clock. The proposed low-power consuming system works in a 12V, 1A rating. We may deploy solar panels for natural ecosystem radial growth measurement to power the cell, thus, making it a green or energy-efficient device.

II. Related Work

Improving the productivity and growth rate of fruits is an emerging and significant research trend. In [2], the authors have discussed a low-cost fruit diameter monitoring device. The authors have discussed on multi-color driving algorithm concerning Pulse Width Modulation duty cycles and spectral power distributions [2]. To optimize the color correlation temperature and index for color rendering, multi-colour plant-growing light signals can significantly exploit photosynthetic radiant effectiveness [2]. On the other hand, in [3], the authors have discussed fabrication, calibration,

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ABOUT THE AUTHORS

Anirbit Sengupta is with the Department of IT, MAKAUT, WB, India. Contact him at Email-ID: anirbit87sengupta@gmail.com

Anwesha Mukherjee is with the Department of Computer Science, Mahishadal Raj College, WB, India. Contact her at Email-ID: anweshamukherjee2011@gmail.com.

Abhijit Das is with the IT Department, RCC Institute of Information Technology, Kolkata, WB, India. Contact him at Email-ID: abhijit.das@rcciit.org

Debashis De is with the Department of CSE, MAKAUT, WB, India. Contact him at Email-ID: debashis.de@makautwb.ac.in

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Toxicological impacts of nanopolystyrene on zebrafish oocyte with insight into the mechanism of action: An expression-based analysis

Ankit Chatterjee [a, 1], Sukhendu Maity [a, 1], Sambuddha Banerjee [b], Shibsankar Dutta [c], Madhuchhanda Adhikari [a], Rajkumar Guchhait [a, d], Chayan Biswas [a], Sukanta De [c], Kousik Pramanick [a, *]

[a] Integrative Biology Research Unit, Department of Life Sciences, Presidency University, West Bengal, India
[b] Department of Zoology, Visva Bharati University, Bolpur, West Bengal, India
[c] Department of Physics, Presidency University, West Bengal, India
[d] P.G. Department of Zoology, Mahishadal Raj College, Garkamalpur, Purba Medinipur, West Bengal, India

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Apoptosis

ABSTRACT

Many studies have investigated the negative impacts of microplastics on teleost fishes with very little or no evidence of their mechanism of action. This scenario entreats us to investigate the toxicities of nanopolystyrene in zebrafish oocyte with emphasis on the mechanism of action. In the present study, the cellular levels of mRNA transcripts of different genetic markers (such as: *sod, gpx, nrf2, inos, ucp2,* and *atp6* (redox-sensitive markers)*; nfkβ, tnfα, il-10, ikβ, gdf9,* and *bmp15* (immune markers); *gadd45, rad51, p53* and *bcl2* (DNA damage and apoptotic)) have been quantified by real-time PCR after 6 h of incubation of isolated oocyte with different doses of nanopolystyrene viz. P0 (control i.e. no polystyrene in culture medium), P1 (100 ng/ml), and P2 (400 ng/ml). Results showed that both the treatment concentrations of nanopolystyrene induce oxidative stress with % DPPH = 30.75, 31.61, and 32.43% for P0, P1, and P2, respectively. Increase in oxidative stress in oocytes with increasing doses of nanopolystyrene was also observed in TBARS assay with MDA content 0.12 and 0.21 μM for P1 and P2, respectively as compared to the control 0.08 μM. This increased oxidative stress can regulate the expression pattern (upregulation/downregulation) of selected genes leading to different toxic effects like oxidative stress, immunotoxicity, and apoptosis in oocytes, which suggests the impairment of reproductive functions by nanopolystyrene.

1. Introduction

Plastic pollution represents a major global concern due to their elevated production and environmental disposal with a low rate of recycling. Regular monitoring of micro/nanoplastics into the environmental samples and their toxicity assessment is important for their environmental risk assessment. Polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethylene terephthalate (PET), and polyvinyl chloride (PVC) are some most widely used forms of thermoplastics. Plastic waste can impose severe negative impacts on the wildlife in an aquatic system (Vegter et al., 2014). Micro/nanoplastics, formed by the biotic and abiotic degradation of large plastic waste, are ubiquitously distributed in all ecosystems (Besseling et al. 2013; Obbard et al., 2014). The aquatic system may serve as a large sink for the environmental accumulation of nanoplastics, where they can induce severe toxicities to the aquatic organisms.

Recently, many studies have reported the negative impacts of microplastics in fishes such as - oxidative stress (Zhao et al. 2013, Brun et al., 2019), reproductive impairments (Sharifinia et al., 2020; Sarasamma et al., 2020; Yin et al., 2021), disrupted glucose metabolism (Brun et al., 2019), neurotoxicity (Kim et al., 2021), DNA breakage, and the increased mortality rate (Zhou et al. 2013). Microplastics can bioaccumulate into different organs like - liver, kidney, gut, gills, brain, and gonads. Different anti-oxidants provide the first line of defense against oxidative stress (Jin et al., 2010) and therefore play a pivotal role in the regulation of oxidative stress (Dong et al., 2018). Zhou et al. (2013) reported the oxidative damage with increased SOD (superoxide

* Corresponding author.
E-mail address: kousik.dbs@presiuniv.ac.in (K. Pramanick).
[1] Joint first author.

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Toxic effects of cyanotoxins in teleost fish: A comprehensive review

Sambuddha Banerjee [a,#], Sukhendu Maity [a,#], Rajkumar Guchhait [b], Ankit Chatterjee [a], Chayan Biswas [a], Madhuchhanda Adhikari [a], Kousik Pramanick [a,*]

[a] Integrative Biology Research Unit, Department of Life Sciences, Presidency University, 86/1, College Street, Kolkata 700073, India
[b] P.G. Department of Zoology, Mahishadal Raj College, Garkamalpur, Purba Medinipur, India

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ABSTRACT

The phenomenon of eutrophication leads to the global occurrence of algal blooms. Cyanotoxins as produced by many cyanobacterial species can lead to detrimental effects to the biome due to their stability and potential biomagnification along food webs. Therefore, understanding of the potential risks these toxins pose to the most susceptible organisms is an important prerequisite for ecological risks assessment of cyanobacteria blooms. Fishes are an important component of aquatic ecosystems that are prone to direct exposure to cyanotoxins. However, relatively few investigations have focused on measuring the toxic potentials of cyanotoxins in teleost fishes. This review comprehensively describes the major toxicological impacts (such as hepatotoxicity, neurotoxicity, immune toxicity, reproductive toxicity and cytogenotoxicity) of commonly occurring cyanotoxins in teleost fishes. The present work encompasses recent research progresses with special emphasis on the basic molecular mechanisms by which different cyanotoxins impose their toxicities in teleost fishes. The major research areas, which need to be focused on in future scientific investigations, have also been highlighted. Protein kinase inhibition, transcriptional dysregulation, disruption of redox homeostasis and the induction of apoptotic pathways appear to be the key drivers of the toxicological effects of cyanotoxins in fish. Analyses also showed that the impacts of cyanotoxins on specific reproductive processes are relatively less described in teleosts in comparison to mammalian systems. In fact, as compared to other toxicological effects of cyanotoxins, their reproductive toxicity (such as impacts on oocyte development, maturation and their hormonal regulation) is poorly understood in fish, and thus requires further studies. Furthermore, additonal studies characterizing the molecular mechanisms responsible for the cellular uptake of cyanotoxins need to be investigated.

Abbreviations: MC-LR, Microcystin LR; CYN, Cylindrospermopsin; NOD, Nodularin; ANTX-a, Anatoxin-a; ANTX-a(s), Anatoxin-a(s); BMAA, β-*N*-methylamino-L-alanine; STX, Saxitoxin; Oatp, Organic Anion Transporter Protein; PP1, Protein Phosphatase 1; PP2A, Protein Phosphatase 2A; PP2C, Protein Phosphatase 2C; LPS, Lipopolysaccharide; *xbp*-1 s, X-box Binding Protein 1 s; *chop*, C/EBP Homologous Protein; *btp*, β-Trace Protein; *atf4*, Activating Transcription Factor 4; *tnfa*/TNFα, Tumor Necrosis Factor α; *dusp5*, Dual Specificity Phophatase 5; ERK, Extracellular Signal-Regulated Kinase; MAPK, Mitogen-activated Protein Kinase; JNK, c-Jun N-terminal Kinase; ROS, Reactive Oxygen Species; RNS, Reactive Nitrogen Species; *sod*/SOD, Superoxide Dismutase; *cat*/CAT, Catalase; *gst*/GST, Glutathione S-transferase; *gpx*/GPx, Glutathione Peroxidase; GSH, Reduced Glutathione; LPO, Lipid Peroxidation; MDA, Malondialdehyde; G6PDH, Glucose 6-Phosphate Dehydrogenase; DW, Dry weight; LC-MS, Liquid Chromatography-Mass Spectroscopy; DPF, Days Post fertilization; BAF, Bioaccumulation Factor; ACh, Acetyl Choline; nAChR, Nicotinic Acetyl Choline Receptor; AChE, Acetyl Cholinesterase; *elavl3*, ELAV-like Protein 3; *gap43*, Growth Associated Protein 43; *gfap*, Glial Fibrillary Acidic Protein; *syn2a*, Synapsin IIa; *shha*, Sonic Hedgehog Protein A; *nkx2.2a*, NK2 Transcription Factor Related 2a; *mbp*, Myelin Basic Protein; *ngn1*, Neurogenin-1; *bcl2*, B-cell Lymphoma 2; *bax*, BCL2 Associated X; *vtg1*/VTG, Vitellogenin; E2, 17β-Estradiol; T, Testosterone; *cyp19a1a*, Cytochrome P450 Aromatase-a1a; *cyp19a1b*, Cytochrome P450 Aromatase-a1b; *17β-hsd*, 17β-hydroxysteroid Dehydrogenase; *hmgra*, HMG-CoA Reductase a; *gnrh3*, Gonadotropin Releasing Hormone 3; *gnrh2*, Gonadotropin Releasing Hormone 2; *gnrhr1*, Gonadotropin Releasing Hormone Receptor 1; *gnrhr2*, Gonadotropin Releasing Hormone Receptor 2; *fshβ*, Follicle Stimulating Hormone β; *lhβ*, Luteinizing Hormone β; *fshr*, Follicle Stimulating Hormone Receptor; *lhr*, Luteinizing Hormone Receptor; *bmp15*, Bone Morphogenic Protein 15; *erα*, Estrogen Receptor α; *pacap1*, Pituitary Adenylate Cyclase-Activating Polypeptide 1; *gh*, Growth Hormone; *igf*, Insulin-like Growth Factor; DHP, 17α,20β-dihydroxy-4-pregnen-3-one; MPF, Maturation Promoting Factor..

* Corresponding author.
E-mail address: kousik.dbs@presiuniv.ac.in (K. Pramanick).
# Equal contribution.

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REVIEW

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Occurrence and distribution of micro/nanoplastics in soils and their phytotoxic effects: A review

Sukhendu Maity[1] | Rajkumar Guchhait[1,2] | Moumita Biswas Sarkar[3] | Kousik Pramanick[1]

[1]Integrative Biology Research Unit (IBRU) Lab, Department of Life Sciences, Presidency University, Kolkata, India

[2]Department of Zoology, Mahishadal Raj College, Purba Medinipur, India

[3]Division of Plant Biology (DPB), Bose Institute, Kolkata, India

Correspondence

Kousik Pramanick, Integrative Biology Research Unit (IBRU) Lab, Department of Life Sciences, Presidency University, Kolkata, West Bengal, India.
Email: kousik.dbs@presiuniv.ac.in

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Abstract

Some recent studies have reviewed the occurrence and phytotoxicity of micro/nanoplastics, but their distribution in the soil environment, mechanisms of uptake by roots and the mode of action are unclear. Thus, this review comprehensively represents the relative abundance of micro/nanoplastics in different soil types and their toxicities in plants with insights into their partitioning to different soil matrices, uptake mechanisms, and the mode of action. Partitioning of micro/nanoplastics to different soil matrices (like—soil particles, naturally occurring soil organic matters, pore waters and soil fauna) could modify their bioavailability to plants. The small micro/nanoplastic particles can be taken up by roots through the apoplastic and symplastic pathways. In this regard, cellular endocytosis and aquaporin might play a significant role. The shape of the polymers can also regulate their uptake, and the polymers with spherical shapes are more easily absorbed by roots than the polymers with other shapes. Bioaccumulation of micro/nanoplastic induces oxidative stress, which, in turn, causes alterations of gene expressions and different metabolic pathways responsible for plant growth, biomass production and synthesis of secondary metabolites.

KEYWORDS

bioavailability, oxidative stress, partitioning, plant uptake, toxicity

1 | INTRODUCTION

Since the 1950s, the worldwide production of different plastic polymers has been increasing very rapidly. According to Plastic Europe (2020), ~370 million tonnes and ~58 million tonnes of plastics have been produced in 2019 as total global and European production, respectively. Packaging, construction, building, and automotive industries are some of the important sectors heavily liable for the consumption of a large fraction (viz. 39.6%, 20.4% and 9.6%, respectively) of total European production. Polyethylene (PE), polyethylene terephthalate (PET), polypropylene (PP), polystyrene (PS) and polyvinylchloride (PVC) are the most common forms of thermoplastic to be used widely.

Based on the size of plastic particles, they can be categorised as macroplastic (>25 mm), mesoplastic (5–25 mm), large microplastic (1–5 mm), small microplastic (1 μm–1 mm), and nanoplastic (<1 μm) (Kim et al., 2021). But it is generally accepted that the plastic particles with diameter <5 mm are microplastics and those with diameter <100 nm are nanoplastics (He et al., 2018; Song et al., 2017). Plastics in the environment can exist in various forms including fibres, films, beads and foams. Micro/nanoplastics may have two types of origin in the natural environment. Firstly, they can be directly released from manufactured products (Guo et al., 2020); and secondly, different environmental processes such as: photo-oxidation (UV mediated), thermo-oxidation (temperature mediated), mechanical forces, biodegradation, and hydrolysis can break up the large plastic fragments

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REVIEW ARTICLE

Interaction of plastic particles with heavy metals and the resulting toxicological impacts: a review

Sukhendu Maity[1] · Chayan Biswas[1] · Sambuddha Banerjee[1] · Rajkumar Guchhait[2] · Madhuchhanda Adhikari[1] · Ankit Chatterjee[1] · Kousik Pramanick[1]

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Abstract

Interactions of plastic particles with different organic/inorganic pollutants including heavy metals impact their ecotoxicological potential, and proper understanding in this regard is important for their ecological risk assessment. However, many studies have reported the interactions between micro-/nanoplastics (MNPs) and heavy metals (HMs), but the most prevalent interactive forces and factors monitoring their interactions are still not clear. So, the present review represents the mechanisms of interactions with special emphasis on major interactive forces and biophysicochemical and environmental factors influencing trace element's adsorption onto the surface of MNPs. Electrostatic interaction and pore-filling mechanism can best explain the HMs adsorption to MNPs. A number of biophysicochemical factors (such as biofilm, size, crystallinity, and surface charge) and environmental factors (such as pH, salt, and temperature) act together for mediating interactions and ecotoxicities of MNPs and HMs in the real environment. From a toxicological point of view, the synergistic mode of action may be more active in animals, whereas the antagonistic activity may be prevalent in plants. Besides polymer density, biofilm formation and agglomeration property of MNPs can control the vertical distribution of MNPs along the water column. Finally, the ecotoxicological potential of MNPs in the natural environment can be considered as a function of spatiotemporal variation in abiotic (including MNPs and heavy metals) and biotic components. This review will be helpful in the detail understanding of ecotoxicological risk assessment of MNPs in relation to their interaction with heavy metals.

Keywords Micro-/nanoplastic · Interactions · Heavy metals · Ecotoxicity · Biophysicochemical factors · Spatiotemporal variation

Introduction

Since last few decades, the concern of plastic pollution has been growing up very rapidly (Browne et al. 2007; Eerkes-Medrano et al. 2015; Galloway et al. 2017; Campanale et al. 2020) due to their scaled-up global production, inadequate waste management, and toxic behaviors. The ubiquitous distribution of MNPs in every environmental compartment and their trophic level transfer can impose threats to the ecosystem and public health (Eerkes-Medrano et al. 2015; Thompson 2015; Vethaak and Leslie 2016; Horton et al. 2017; Chae and An 2017; Hodson et al. 2017; Chae and An 2018; Zhang and Liu 2018). Many studies have already reported different toxicological effects of MNPs including developmental toxicity, reproductive toxicity, neurotoxicity, immunotoxicity, cytotoxicity, and phytotoxicity (Supplementary table 1). MNPs induce toxic effects by disrupting redox homeostasis (oxidative stress) and modulating gene expression (Alomar et al. 2017; Espinosa et al. 2017; Yu et al. 2018). The increased surface area of MNPs and surface chemistry enable them to interact with organic/inorganic pollutants (Turner and Holmes 2015; Wang et al. 2019; Tang et al. 2020; Mao et al. 2020; Singh et al. 2020). Thus, MNPs can act as vectors for a large number of organic/inorganic pollutants including HMs due to their sorption

Chayan Biswas, Sambuddha Banerjee and Rajkumar Guchhait contributed equally to this work.

Responsible Editor: Philippe Garrigues

✉ Kousik Pramanick
kousik.dbs@presiuniv.ac.in

[1] Integrative Biology Research Unit (IBRU), Department of Life Sciences, Presidency University, 86/1 College Street, Kolkata, West Bengal 700073, India

[2] Mahishadal Raj College, Garkamalpur, Purba Medinipur, West Bengal 721628, India

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Overview on Anorexia Nervosa: An eating disorder

Anirban Pattanayak[1], Eshita Manna[2], Paromita Mukherjee[3], Payel Kumar Roy[4] and Swati Nakhale*[5]

[1]State Aided College Teacher, Dept. of Physiology, Mahishadal Raj College, Vidyasagar University, West Bengal, India.
[2]Laboratory in charge, Haldia Institute of Health Sciences, West Bengal, India.
[3,] Assistant Professor, Dept. of Food and Nutrition, Swami Vivekananda University, Barrackpore. West Bengal, India.
[4] HOD of Dietetics, Dept. of Techno India DAMA Healthcare Medical Centre, West Bengal, India.
[5] Principal, IIFST, Aurangabad, Maharashtra, India
Corresponding Author Email Id: swatinakhale28@gmail.com

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ABSTRACT

Anorexia nervosa is a serious mental disorder with a characteristic appearance. It can affect people of all ages, genders, sexual orientations, races, and ethnicities, but it is especially dangerous for adolescent girls and young adult women. Anorexia is caused by a combination of psychological, societal, and biological variables, and there is no single cause. Anorexia nervosa affects about 0.5–1.0 percent of women over the world. Previous research suggested that anorexia nervosa is a condition that exclusively affects women in Western countries; however, recent research has showed that it is more common in boys than previously assumed.The higher rate of anorexia nervosa in western countries compared to non-western countries was explained by cultural differences, as western culture places a high priority on thinness in young women. Being skinny, on the other hand, is socially unacceptable in most non-western cultures. Although anorexia nervosa is primarily a problem in Western countries, current data suggests that it is spreading to non-Western countries in both genders. This phenomenon was explained by a number of factors, including Western media attention, social and parental pressure, genetic and biochemical variables, and other psychological problems including such sexual abuse and poor self are also contributors.

KEYWORDS: eating disorder, Western media attention, social and parental pressure, genetic and biochemical variables, Depression, anxiety

1. INTRODUCTION

Eating disorder is a psychological condition characterised by food avoidance, excessive consumption, or purging. It's also been stated that eating disorders are a form of dependency. Eating becomes a source of reliance, disrupting everyday life's equilibrium**(Arcelus*et al.*, 2011)**. Others define eating disorders as a disease that leads to the adoption of unhealthy eating behaviours. Teenage girls and young women are more likely to suffer from these diseases. Psychologists define an eating disorder as a psychiatric condition that interferes with normal eating behaviour**(Smith, 2012)**.

Characteristics of Eating Disorder

Extremes characterise this illness. It appears when a person's eating behaviour is severely disrupted, such as intense distress or concern over body weight or shape. Unlike hysteria, an eating disorder involves manipulating one's food intake and being obsessive about one's own body's shape and weight**(Attia,**

It is evident that luteinizing hormone (LH) secretion pattern slows down which ultimately leads to reduced ovarian stimulation, cessation of menstruation and amenorrhea**(Steinhausen, 2002)**.

Thus, patients having anorexia nervosa exhibits a wide range of symptoms, associated with hypothyroidism, cold intolerance, hypothermia, constipation, reduced basal metabolic rate (BMR), bradycardia, and hypercholesterolemia**(Mitchell & Crow, 2006)**.

3. CONCLUSIONS:

Although, anorexia nervosa is the issue of Western-countries; however recent evidence suggests its spread in both gendersamong non-Western countries. Many factors explained this phenomenon, of which Westernmedia exposure, peer and family pressure,genetic and molecular factors and other psychological factors as sexual abuse and low self-steam.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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Anirban Pattanayak
State Aided College Teacher, Department of Physiology, Mahishadal Raj College, West Bengal, India

Souvik Tewari
Assistant Professor, Department of Food and Nutrition, Swami Vivekananda University, Barrackpore, West Bengal, India

Mainak Sur
Assistant Professor, Department of Physiotherapy, Swami Vivekananda University, Barrackpore, West Bengal, India

Titlee Majumder
Assistant Professor, Department of Physiotherapy, Swami Vivekananda University, Barrackpore, West Bengal, India

Corresponding Author:
Titlee Majumder
Assistant Professor, Department of Physiotherapy, Swami Vivekananda University, Barrackpore, West Bengal, India

Malnutrition and immunity: A review

Anirban Pattanayak, Souvik Tewari, Mainak Sur and Titlee Majumder

Abstract
Malnutrition, which includes both lack and overnutrition, is a major cause of disease and mortality around the world. Malnutrition is caused by dietary absorption problems, but it is also marked by recurring infections and persistent inflammation, signaling an underlying immunological problem. Defects arise in the immunoepigenome of impoverished parents before birth, and these may lead to intergenerational malnutrition cycles. Immune dysfunction is both a cause and a consequence of starvation, according to this review, which includes major recent data from experimental animals, *in vitro* models, and human cohorts. We emphasize gaps in existing understanding of immune- physiological dysfunction in malnutrition, with the goal of therapeutically addressing immunological pathways as a novel strategy to reduce morbidity and death in children.

Keywords: Immunoepigenome, low of protein diet, malnutrition cycles, immune dysfunction, dietary absorption

Introduction

Malnutrition as an Immunodeficiency Syndrome

Malnutrition, which includes both under- and over-nutrition, causes a huge health burden worldwide (Rahman and Adjeroh, 2015; Black *et al*., 2013) [35, 6]. Nutritional aspects have always found to be very instrumental with the physiological attributes not only that various nutritional changes input various physiological changes projecting the deficiency and sufficiency of the key factors responsible for the particular nutrient markers.

Despite being usually described as poor nutritional digestion, malnutrition is not solely caused by a lack of food intake. Obesity can develop without a poor diet and continue even if a healthy diet is adopted (Clemente *et al*., 2012; DeBoer *et al.,* 2012; Godfrey *et al.,* 2011; Gregor and Hotamisligil, 2011; van der Klaauw and Farooqi, 2015) [8, 11, 17, 19, 48], while intensive feeding therapies only marginally reduce stunting prevalence (Bhutta, 2008). Despite the fact that under- and overnutrition manifest as separate physical defects, several studies suggest that they share etiological pathways: early-life undernutrition increases the risk of obesity later in life (DeBoer *et al.,* 2012; Roseboom, 2006) [11, 38], altered metabolism (Bartz *et al*., 2014; Kong *et al*., 2014; O'Keefe *et al.,* 2015) [3, 24, 29], chronic inflammation (Kong *et al.,* 2014; Prendergast *et al.,* 2014; Kosek *et al.,* 2013) [24, 32, 25], and gut dysfunction (enteropathy) (Kong *et al.,* 2014; O'Keefe *et al.,* 2015; Subramanian *et al.,* 2014) [24, 29, 46], in overweight people, excessive calorie and macronutrient intake is commonly linked to micronutrient deficiencies. Malnutrition is increasingly being recognized as a complex condition with overlapping and poorly understood comorbidities (Humphrey, 2009; Prendergast *et al.,* 2014; Ahmed *et al.,* 2014) [21, 33, 2]. In order to create novel therapeutic diet (Therapeutic diet is a diet which is given to the patient who is suffering from any type of disease condition (Tewari, 2019) [47] to support international aims to increase nutrition, health, and well-being, pathogenesis across the malnutrition spectrum must be characterized.

Malnutrition affects immunity

A primary immunodeficiency is an immune system condition caused by a genetic or developmental defect. Secondary or acquired immunodeficiency is the loss of immunological function caused by a range of external factors. Although infection with the human immunodeficiency virus (HIV) is the most well-known cause of secondary immunodeficiency, acute malnutrition is the most prevalent cause of immunodeficiency worldwide, affecting up to 50% of the population in some underprivileged communities (Geraix *et al.,* 2008) [15]. Both innate and adaptive immunity are affected by immune system abnormalities.

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Human/Non-human Interface and the Affective Uncanny in Amitav Ghosh's *Gun Island*

Asis De[i]

Abstract
Postcolonial fiction depicting transnational human mobility across landscapes and cultural spaces often represents the variable "structure of feeling" in a human being with continuous 'de-' and 're-territorialization' (Grossberg 313) from the familiar space to the unfamiliar. Experiences of lived realities and relationships alter with time and space, simultaneously affecting human understanding of logic and thereby leaving a scope to interpret newer experiences on multiple levels such as the mysterious, uncanny, or the exotic. It is not just the fictional character/s in literary narratives but also the reader/s who feel affected by the relationality between the rational and the mysterious as emotional affect "arises in the midst of in-between-ness" (Seigworth and Gregg 1). The epistemic lens of affect theory has been used in this essay to explore the human/non-human relationships in Amitav Ghosh's novel *Gun Island* (2019). I would show how, in Ghosh's narrative, the human/non-human interface has been perceived by inventories of belonging and migration, and often represented with an interplay of the corporeal and the uncanny, mainly aiming at emotional affect sandwiched between anxiety and hope— both conditions of postcoloniality and ecological engagement. The representation of the human/non-human relationships in literary narratives depends heavily on imaginative correspondence, where the affective exceptional may find its easy place. Examining several episodes in the novel, I would discuss how the corporeality of a snake, spider, shipworm, or even a wildfire affects the incorporeal cognitive dimensions like trauma or anxiety in Dinanath— the central character, and reshapes his "structure of feeling."

Keywords
human/non-human interface, affect, uncanny, corporeal, sensorial

Introduction

One of the exclusive twenty-first-century cultural phenomena is the ever-increasing use of digital and computational technology and devices, where space for the imaginative and the emotional requires, quite naturally, a new reconfiguration. The visible emergence of the interdisciplinary research network of affect studies in the last two decades can be seen as a part of this process of cultural reconfiguration. While the application of digital and computational technology demonstrates the *relatedness* of corporeal organic matters with logical and mathematical precision, the critical lens of Affect theory "*accumulates* across both relatedness and interruptions in relatedness" (Seigworth and Gregg 2). In the 'Introduction' to *The Affect*

Seigworth, Gregory J. and Melissa Gregg. "An Inventory of Shimmers." *The Affect Theory Reader*, edited by Melissa Gregg and Gregory J. Seigworth, Duke University Press, 2010, pp. 1-25.

Stewart, Kathleen. "Worlding Refrains," *The Affect Theory Reader*, edited by Melissa Gregg and Gregory J. Seigworth, Duke University Press, 2010, pp. 339-353.

Trigg, Dylan. *The Memory of Place: A Phenomenology of the Uncanny*. Ohio University Press, 2012.

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Notes

[1] In the book launch event of *Gun Island* in Delhi on 19 June 2019, Ghosh admits that the novel is not just about climate change, it's much more: "I wouldn't say it's climate change, it's not just that…it's something much more complicated, it's the reality that we live in, and the reality that we live in today is so fractured, is so sort of strange that there's something so uncanny about the way the world is changing." See the full interview here: https://www.youtube.com/watch?v=r5RbdChKMv4 (accessed 25 January 2021).

[2] In both the post-publication book launch events in Delhi and Kolkata, Ghosh claims that in no way, *Gun Island* should be seen as the sequel of *The Hungry Tide*, which he wrote fifteen years back in 2004. However, there are some conceptual connections between the two novels. The Delhi book launch event could be accessed here: https://www.youtube.com/watch?v=r5RbdChKMv4 (accessed 25 January 2021); For the Kolkata event, see: https://www.youtube.com/watch?v=lr41o6qNl1g (accessed 25 January 2021).

[3] In the medieval Bengali literature entitled *Manasamangal Kāvya* authored by Khemananda and in some other Bengali folkloric legends, one may notice such merchant figures that stand as powerful and ruthless men, mostly Shaivaites by religion and without any reverence for the "subaltern" deities like Manasa. Like the Gun Merchant in Ghosh's *Gun Island*, the most well-known of such traders is Chandradhar or Chand Sadagar. See *Manasamangal Kāvya* for details.

i. Asis De is an Associate Professor and Head of the Department of English (UG and PG), Mahishadal Raj College (West Bengal), India. He specialises in cultural identity, diaspora and transnationalism, ecological humanities, family sociology and kinship studies, tribal studies, and disability studies in Anglophone Asian, Caribbean, African, and Australian literatures. He has presented his research papers in conferences in India, Nepal, Egypt, South Africa, and in Europe (Belgium, Germany, England, France, Scotland, Switzerland, Italy, Spain, and Austria). His latest publications are *Mapping South Asian Diaspora: Recent Responses and Ruminations* (2018) (co-edited), "The lost years of a nomad: Exploring Indian experience in Nuruddin Farah's literary oeuvre" in TYDSKRIF VIR LETTERKUNDE, 57(1) 2020, and "The Great Derangement" in *The Literary Encyclopaedia*. 05 April 2021. His forthcoming volume on Amitav Ghosh awaits publication by Brill in 2021.

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16. *VRATA* AND *ĀLPANĀ* OF BENGAL : DEMYSTIFYING SYMBOLIC ART 120
KAKALI GHOSH

17. REFLECTION OF WORLD POLITICS IN 'DHARITRIPATINIRVĀCANAM' 134
SUSHREE CHAKRABORTY

18. RASA THEORY WITH SPECIAL REFERENCE TO *NĀṬYAŚĀTRA* 142
SUBHRAJIT SEN

19. INFLUENCE OF MARRIAGE ECONOMY IN KAUṬILYA'S ARTHAŚĀSTRA 154
ASHOKTARU PANDA

20. SOME PHRASES OF *SAṀBANDHA-VĀRTTIKA* OF SUREŚVARĀCĀRYA IN THE LIGHT OF *NYĀYAKALPALATIKĀ* AND *ŚĀSTRAPRAKĀSIKĀ* 159
CHAITALI KANJILAL

21. EVIDENCE OF VEDIC CULTURE IN SELECT INSCRIPTIONS OF NORTHERN AND EASTERN INDIA 167
KAUSHIK ACHARYA

22. THREE MERCHANTS OF GUJARAT IN THE THIRTEENTH CENTURY : BEYOND BUSINESS 181
SULAGNA PRADHAN

23. *CANDRĀLOKAḤ* AND *KUVALAYANĀNDA*—A COMPARATIVE STUDY 191
SEBANTI SINHA

24. PATAÑJALI'S *AṢṬĀṄGA-YOGA* : A GREAT MESSAGE TO MANKIND IN MODERN SOCIETY 197
BHUTNATH JANA

SECTION-C

25. পবিত্র ধর্মকথার পরিপ্রেক্ষিতে ভারতীয় সভ্যতা ও সাহিত্যে মূল্যায়ন 205
প্রদ্যোৎ কুমার দত্ত

26. বৈশেষিকসূত্রের আঙ্গিকে প্রত্যক্ষপ্রমাণের প্রামাণ্য 214
বিভাস মিস্ত্রী

27. ন্যায়মতে জীবাত্মা নিত্য ও পূর্বজন্মের সাধক—এক সমীক্ষাত্মক আলোচনা 220
সুদীপ্তা হালদার

28. গার্হস্থ্যাশ্রম-নির্ভর প্রাচীন-ভারতীয় অর্থনীতি—একটি বিশেষ সমীক্ষা 227
প্রভাস মণ্ডল

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বৈশেষিকসূত্রের আঙ্গিকে প্রত্যক্ষপ্রমাণের প্রামাণ্য

বিভাস মিস্ত্রী

সারসংক্ষেপ

বৈশেষিক মতে প্রত্যক্ষ ও অনুমান এই দুটি প্রমাণ স্বীকৃত। প্রত্যক্ষকে বলা হয় প্রমাণজ্যেষ্ঠ, অর্থাৎ সমস্ত প্রমাণের মধ্যে প্রত্যক্ষ সর্বাপেক্ষা গুরুত্বপূর্ণ। প্রত্যক্ষ প্রমাণ সমস্ত সম্প্রদায়ে স্বীকৃত। প্রত্যক্ষের প্রামাণ্য বিষয়ে কোন বিবাদ নেই। বৈশেষিকদর্শনের প্রাচীনতম মূলগ্রন্থ হল কণাদ রচিত বৈশেষিকসূত্র। বৈশেষিকসূত্রে প্রত্যক্ষ প্রমাণের স্বরূপ সম্পর্কে প্রায় কিছুই পাওয়া যায় না। প্রত্যক্ষকে একটি বিষয়রূপে নির্দিষ্ট করে কোন আলোচনা করা হয়নি। তবে একথা ঠিক যে, কোন কোন প্রসঙ্গে অবশ্যই প্রত্যক্ষপ্রমাণ বা তার কারণ সম্পর্কে উল্লেখ রয়েছে। যেমন তৃতীয় অধ্যায়ের প্রথম আহ্নিকে আত্মার অস্তিত্ব প্রমাণের প্রসঙ্গে একটি সূত্রে বলা হয়েছে আত্মা ও ইন্দ্রিয়ার্থ সন্নিকর্ষ থেকে জ্ঞান উৎপন্ন হয়। এখানে প্রত্যক্ষ শব্দের উল্লেখ না থাকলেও ইন্দ্রিয়ার্থ সন্নিকর্ষের উল্লেখ থাকায় বোঝা যাচ্ছে যে, প্রত্যক্ষের কথাই বলা হয়েছে। প্রত্যক্ষ এমন একপ্রকার জ্ঞান যা চতুষ্টয়সন্নিকর্ষ থেকে উৎপন্ন হয়। টীকাকাররা তাই বলেছেন, আত্মার সঙ্গে মনের সংযোগ হয়, মনের সঙ্গে ইন্দ্রিয়ের সংযোগ হয় এবং ইন্দ্রিয়ের সঙ্গে বিষয়ের সংযোগ হলে প্রত্যক্ষ উৎপন্ন হয়। বৈশেষিকসূত্রের প্রাচীন কোন ব্যাখ্যা পাওয়া যায় না। কণাদ প্রদত্ত প্রত্যক্ষের লক্ষণসূত্রটি উল্লেখ করে বৌদ্ধ দার্শনিক দিঙ্‌নাগের মন্তব্য এখানে আমি আলোচনা করছি। পূর্বপক্ষীর যুক্তি উল্লেখ করে প্রত্যক্ষ বিষয়ে গৌতমের মতও আলোচনা করছি আমার এই প্রবন্ধে।

শব্দসংকেত ঃ প্রত্যক্ষ, ইন্দ্রিয়ার্থসন্নিকর্ষ, চতুষ্টয়সন্নিকর্ষ, দ্ব্যণুক, উদ্ভূতত্ব, অনভিভূতত্ব, রসত্ব।

বৈশেষিকসূত্রের আঙ্গিকে প্রত্যক্ষপ্রমাণের প্রামাণ্য ঃ

বৈশেষিক মতে প্রত্যক্ষ ও অনুমান এই দুটি প্রমাণ স্বীকৃত। প্রত্যক্ষকে বলা হয় প্রমাণজ্যেষ্ঠ, অর্থাৎ সমস্ত প্রমাণের মধ্যে প্রত্যক্ষ সর্বাপেক্ষা গুরুত্বপূর্ণ। প্রত্যক্ষ প্রমাণ সমস্ত সম্প্রদায়ে স্বীকৃত। প্রত্যক্ষের প্রামাণ্য বিষয়ে কোন বিবাদ নেই। এমনকি চার্বাকরাও প্রত্যক্ষকে প্রমাণরূপে স্বীকার করেন। দ্বিতীয়তঃ প্রত্যক্ষ ভিন্ন প্রমাণগুলি প্রত্যক্ষের উপর নির্ভরশীল হয়। প্রত্যক্ষ প্রমাণের গুরুত্ব আরো কারণ হলো যে, প্রত্যক্ষ প্রমাণের দ্বারা জ্ঞান উৎপন্ন হলে সে বিষয়ে কোন প্রকার সংশয়ের অবকাশ থাকে না। এইসব যুক্তিতে প্রত্যক্ষকে সবার উপরে স্থান দেওয়া হয়।১

বৈশেষিকসূত্রে প্রত্যক্ষ ঃ

বৈশেষিকদর্শনের প্রাচীনতম মূলগ্রন্থ হল কণাদ রচিত *বৈশেষিকসূত্র*। *বৈশেষিকসূত্রে* প্রত্যক্ষ প্রমাণের স্বরূপ সম্পর্কে প্রায় কিছুই পাওয়া যায় না। প্রত্যক্ষকে একটি বিষয়রূপে নির্দিষ্ট করে কোন আলোচনা করা হয়নি। তবে একথা ঠিক যে, কোন কোন প্রসঙ্গে অবশ্যই প্রত্যক্ষপ্রমাণ বা তার কারণ সম্পর্কে উল্লেখ রয়েছে। যেমন তৃতীয় অধ্যায়ের প্রথম আহ্নিকে আত্মার অস্তিত্ব প্রমাণের প্রসঙ্গে একটি সূত্রে বলা হয়েছে আত্মা ও ইন্দ্রিয়ার্থসন্নিকর্ষ থেকে জ্ঞান উৎপন্ন হয়।[২] এখানে প্রত্যক্ষ শব্দের উল্লেখ না থাকলেও

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ইন্দ্রিয়ার্থসন্নিকর্ষের উল্লেখ থাকায় বোঝা যাচ্ছে যে, প্রত্যক্ষের কথাই বলা হয়েছে। আবার তৃতীয় অধ্যায়ের দ্বিতীয় আহ্নিকে মনের অনুমান প্রসঙ্গে একটি সূত্রে বলা হয়েছে, আত্মা ও বিষয়ের সম্বন্ধ সত্ত্বেও জ্ঞানের উৎপত্তি ও অনুৎপত্তি মনের অনুমাপক হয়।[৩] পঞ্চম অধ্যায়ের দ্বিতীয় আহ্নিকে একটি সূত্র পাওয়া যায়, সেই সূত্রে বলা হয়েছে, আত্মা, ইন্দ্রিয়, মন ও অর্থের সন্নিকর্ষ থেকে সুখ ও দুঃখ উৎপন্ন হয়। সূত্রটির ব্যাখ্যায় শঙ্করমিশ্র বলেছেন শুধু সুখ ও দুঃখই নয়, জ্ঞান এবং প্রযত্ন এই চারটির সম্বন্ধ থেকে উৎপন্ন হয়।[৪] আলোচিত প্রসঙ্গ যাই হোক না কেন একথা স্পষ্ট যে, প্রত্যক্ষ এমন একপ্রকার জ্ঞান যা চতুষ্টয়সন্নিকর্ষ থেকে উৎপন্ন হয়। টীকাকাররা তাই বলেছেন, আত্মার সঙ্গে মনের সংযোগ হয়, মনের সঙ্গে ইন্দ্রিয়ের সংযোগ হয় এবং ইন্দ্রিয়ের সঙ্গে বিষয়ের সংযোগ হলে প্রত্যক্ষ উৎপন্ন হয়। বৈশেষিকসূত্রের প্রাচীন কোন ব্যাখ্যা পাওয়া যায় না। শঙ্কর মিশ্র প্রভৃতি টীকাকাররা অনেক পরবর্তীকালের, ততদিনে নানা রকম মতবাদ প্রচলিত হয়ে গেছে। টীকাকাররা ঐ সব মতবাদের দ্বারা প্রভাবিত হয়ে কণাদের সংক্ষিপ্ত সূত্রের মধ্যে নানা রকম তাৎপর্য উদ্ভাবন করেন। কিন্তু এইসব ব্যাখ্যা ঐতিহাসিকভাবে এবং যুক্তিগতভাবে কতখানি গ্রহণযোগ্য সে বিষয়ে সংশয়ের অবকাশ থেকেই যায়।

সাধারণতঃ বলা হয়, চতুষ্টয়সন্নিকর্ষ থেকে প্রত্যক্ষ জ্ঞান উৎপন্ন হয়। কিন্তু প্রত্যক্ষজ্ঞানের ক্ষেত্রে করণ কি? প্রত্যক্ষ প্রমাণ বলতে ঠিক কোনটিকে বোঝায় এ বিষয়ে স্পষ্ট নির্দেশ কণাদের সূত্রে পাওয়া যায় না। এই প্রসঙ্গে বৌদ্ধ দার্শনিক দিঙ্‌নাগের মন্তব্য থেকে সাহায্য পাওয়া যায়। তাঁর বিখ্যাত গ্রন্থ 'প্রমাণসমুচ্চয়ে'র প্রত্যক্ষ পরিচ্ছেদে বৈশেষিক মতের সমালোচনায় প্রত্যক্ষের করণ বিষয়ে দুটি মত প্রচলিত ছিল, এই রকম তথ্য পাওয়া যায়। কণাদ প্রদত্ত প্রত্যক্ষের লক্ষণ সূত্রটি উল্লেখ করে দিঙ্‌নাগ বলেছেন ঃ

'কেচিৎ প্রমাণাৎ ফলমর্থান্তরমিচ্ছন্তোঽসাধারণকারণত্বাদিন্দ্রিয়ার্থসন্নিকর্ষঃ প্রমাণমিত্যাহুঃ।'[৫]

প্রমাণ ও প্রমাণের ফল ভিন্ন না কি অভিন্ন এ বিষয়ে ভারতীয়দর্শনে ভিন্ন ভিন্ন মত পাওয়া যায়। বৈশেষিকরা প্রমাণ ও তার ফলকে ভিন্ন বলে মনে করেন। একদল মনে করেন, ইন্দ্রিয়ার্থসন্নিকর্ষকে প্রমাণ অর্থাৎ করণ স্বীকার করা উচিত। কারণ সন্নিকর্ষই প্রত্যক্ষের ক্ষেত্রে অসাধারণ কারণ। কারণ বলতে অসাধরণ কারণকেই বোঝায়। এই মত প্রায় সকলেই স্বীকার করেন। প্রত্যক্ষের ক্ষেত্রে অন্যান্য যে সন্নিকর্ষের কথা বলা হয়েছে সেগুলি স্মৃতি প্রভৃতি অন্যান্য জ্ঞানের ক্ষেত্রেও কারণ হওয়ায় সাধারণ কারণরূপে গণ্য হয়। অসাধারণ ধর্মকে উল্লেখ করে লক্ষণ করাই নিয়ম। সাধারণ ধর্মকে লক্ষণরূপে উল্লেখ করা ঠিক নয়। কারণ তাহলে অতিব্যাপ্তির আশঙ্কা দেখা দেয়। প্রত্যক্ষ ভিন্ন অন্য জ্ঞানের ক্ষেত্রে ইন্দ্রিয়সন্নিকর্ষ কারণ হয় না। প্রমাণসমুচ্চয়ের বিখ্যাত টীকাকার জিনেন্দ্রবুদ্ধি মনে করেন শ্রায়স্ক প্রভৃতি এই মতের সমর্থক ছিলেন।[৬] কিন্তু অন্যেরা মনে করেন আত্মমনঃসন্নিকর্ষই প্রধান, এই সন্নিকর্ষকেই করণের মর্যাদা দেওয়া উচিত। জিনেন্দ্রবুদ্ধির মতে রাবণ প্রভৃতি এই মত পোষণ করতেন। জ্ঞানের ক্ষেত্রে আত্মা ও মন এই দুটি পদার্থই প্রধান। ফলে তাদের সন্নিকর্ষও প্রধান হওয়া উচিত। আত্মার প্রাধান্যের কারণ হল আত্মাই জ্ঞানের কর্তা। দ্বিতীয়তঃ জ্ঞানই হয় আত্মার অনুমাপক লিঙ্গ। বৈশেষিক মতে জ্ঞান গুণপদার্থ। প্রত্যেকটি গুণ কোন না কোন দ্রব্যে সমবায় সম্বন্ধে বিদ্যমান হয়। পৃথিবী প্রভৃতি অন্য কোন দ্রব্য জ্ঞানের আশ্রয় হতে পারে না। সেজন্য জ্ঞানের আশ্রয় হয় এমন দ্রব্যরূপে আত্মাকে স্বীকার করা হয়। তৃতীয়তঃ আত্মা ফলের ভোক্তা। অদৃষ্টের দ্বারা সুখ দুঃখ ইত্যাদি যে ফল উৎপন্ন হয়, সেগুলি আত্মাতেই বিদ্যমান হয়। অন্য কোন দ্রব্য ভোক্তা হয় না। অতএব আত্মা প্রধান। মনেরও প্রাধান্য

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আছে। কারণ মন হচ্ছে সর্ববিষয়ক। মন ভিন্ন চক্ষু প্রভৃতি যে পাঁচটি ইন্দ্রিয় স্বীকার করা হয়েছে সেগুলির বিষয় নিয়ত বা নির্দিষ্ট। যেমন চক্ষু কেবল রূপকে গ্রহণ করে, গন্ধকে গ্রহণ করে না। নাসিকা কেবল গন্ধকে গ্রহণ করে, কিন্তু রূপকে গ্রহণ করে না। মনের ক্ষেত্রে এইরকম নির্দিষ্ট নিয়ম নেই। যে কোন প্রত্যক্ষে অবশ্যই মনের ভূমিকা থাকে। জ্ঞান ইচ্ছা প্রভৃতি সমস্ত আত্মার বিশেষ গুণের উৎপত্তিতে আত্মমন-সংযোগ সমবায়িকারণ হয়। সুতরাং অন্যান্য ইন্দ্রিয়ের অপেক্ষায় মনকেই প্রধান বলা যায়। এই যুক্তিতে আত্মমনঃ সংযোগকে প্রত্যক্ষের কারণ বলা উচিত।[৭]

এখানে উল্লেখযোগ্য যে, প্রাচীনকালে এই বিষয়ে যে বিবাদ ছিল তার পরিচয় গৌতমের *ন্যায়সূত্রেও* পাওয়া যায়। *ন্যায়সূত্রের* প্রথম অধ্যায়ের প্রথম আহ্নিকের চতুর্থ সূত্রে গৌতম প্রত্যক্ষের লক্ষণ বলেছেন।[৮] সেখানে তিনি বলেছেন প্রত্যক্ষ এমন একপ্রকার জ্ঞান যা ইন্দ্রিয়ার্থসন্নিকর্ষ থেকে উৎপন্ন হয়। এই সূত্রের ভাষ্যে বাৎস্যায়ন প্রথমেই একটি পূর্বপক্ষের উত্থাপন করেছেন যে, গৌতমের প্রত্যক্ষ লক্ষণটি সংগত হয়নি। কারণ শুধুমাত্র ইন্দ্রিয় ও অর্থের সন্নিকর্ষ হলেই প্রত্যক্ষ উৎপন্ন হয় না। আত্মা ও মন এবং মন ও ইন্দ্রিয়ের সংযোগও অপেক্ষিত হয়। সুতরাং গৌতমের ঐ সন্নিকর্ষগুলিকেও উল্লেখ করা উচিত ছিল।[৯] বাৎস্যায়ন চতুর্থ সূত্রের ভাষ্যে এই পূর্বপক্ষ উত্থাপন করলেও সূত্রাকার গৌতম কিন্তু নিজেই দ্বিতীয় অধ্যায়ে এই আপত্তির আলোচনা করেচেন এবং উত্তর দিয়েছেন। ন্যায়সূত্রে গৌতম প্রমাণ প্রভৃতি ষোলটি পদার্থের উদ্দেশ্য, লক্ষণ ও পরীক্ষা এই তিনটি ধাপে স্বরূপ নির্ণয় করেছেন। তিনটি সূত্রে তিনি পূর্বপক্ষীদের বক্তব্য উপস্থাপিত করেছেন।[১০] পূর্বপক্ষীদের দাবী, প্রত্যক্ষের লক্ষণে সমস্ত প্রয়োজনীয় কথা বলা হয়নি, লক্ষণটি অসম্পূর্ণ। আত্মা ও মনের সন্নিকর্ষ না হলে প্রত্যক্ষ উৎপন্ন হয় না। প্রত্যক্ষ পূর্বে বিদ্যমান থাকে শুধুমাত্র এই যুক্তিতে যদি ইন্দ্রিয়ার্থসন্নিকর্ষকে করণ বলা হয়, তাহলে দিক, দেশ, কাল এবং আকাশের ক্ষেত্রেও সেকথা প্রযোজ্য হতে পারে। দিক ইত্যাদি পদার্থগুলি নিত্য এবং বিভু। তারা সর্বদা সর্বত্র বিদ্যমান থাকে। তারা সমস্ত কার্যের পূর্ববর্তী হয়, প্রত্যক্ষেরও পূর্ববর্তী হয়। ফলে তাদেরও প্রত্যক্ষে কারণ হওয়ার আপত্তি হয়।[১১]

পূর্বপক্ষীর যুক্তি উল্লেখ করার পর গৌতম তার নিজের মতে বলেছেন। প্রত্যক্ষের লক্ষণে আত্মমনঃ সংযোগের উল্লেখ নেই, একথা ঠিক। তবে এর অর্থ এই নয় যে, প্রত্যক্ষে এই সংযোগের গুরুত্ব গৌতম স্বীকার করেন না। আত্মমনঃসংযোগ যে প্রত্যক্ষের কারণ হয়, একথা বোঝা যায় গৌতমের অন্য একটি সূত্রের তাৎপর্য থেকে[১২] গৌতমের মতে আত্মা দেহাতিরিক্ত পদার্থ এবং প্রমেয়ের অন্তর্ভূক্ত। আত্মার অস্তিত্বের প্রমাণ হল অনুমান এবং সেই অনুমানে হেতু হয় জ্ঞান। অর্থাৎ জ্ঞানের আশ্রয় হল আত্মা। আত্মা একটি দ্রব্য এবং জ্ঞান তার গুণ। সুতরাং আত্মা জ্ঞান মাত্রের কারণ হয়। কিন্তু আত্মা নিত্য, সর্বকালে বিদ্যমান হয়। তবু বাস্তব ঘটনা হল সর্বকালে আত্মাতে জ্ঞান জন্মে না। কাজেই স্বীকার করতে হয় আত্মা জ্ঞানের উৎপত্তিতে কোন সংযোগবিশেষের উপর নির্ভর করে। ঐ বিশেষ সংযোগ হল আত্মমনঃসংযোগ। এজন্য আলাদা করে এই সংযোগের কথা প্রত্যক্ষসূত্রে বলা হয়নি।

আত্মমনঃসংযোগের মতো ইন্দ্রিয়মনঃসংযোগও প্রত্যক্ষের কারণ। তবুও প্রত্যক্ষসূত্রে তার উল্লেখ নেই। কিন্তু এতে কোন অসংগতি হয় না। কারণ অন্যতম প্রমেয় মন সম্পর্কে গৌতম একটি সূত্রে বলেছেন, একই ক্ষণে অনেকগুলি জ্ঞান জন্মে না, এ থেকে মনের অনুমান হয়।[১৩] ন্যায়বৈশেষিকদের একটি নিজস্ব মত হল যে, বিভিন্ন ইন্দ্রিয়ের নিজ নিজ বিষয়ের সঙ্গে যুগপৎ সম্বন্ধ হলেও একই ক্ষণে জ্ঞানগুলি উৎপন্ন

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হয় না। এর কারণ হল মন অণুপরিমাণ হওয়ায় একই ক্ষণে অনেক ইন্দ্রিয়ের সঙ্গে মনের সংযোগ সম্ভব হয় না। একটি ক্ষণে যে ইন্দ্রিয়ের সঙ্গে মনের সম্বন্ধ হয়, সেই ক্ষণে সেই ইন্দ্রিয়ের দ্বারা প্রত্যক্ষ উৎপন্ন হয়। এই সিদ্ধান্ত থেকে পাওয়া যায়, জ্ঞানের উৎপত্তিতে মন ও ইন্দ্রিয়ের সংযোগেরও ভূমিকা আছে। সুতরাং প্রত্যক্ষসূত্রে তার উল্লেখ না থাকলেও কোন দোষ হয় না।

ইন্দ্রিয়ার্থসন্নিকর্ষকেই নাম করে উল্লেখ করে কোন প্রত্যক্ষের লক্ষণ বলা হয়েছে এ বিষয়ে গৌতম যুক্তি উপস্থাপিত করেছেন। আত্মমনঃসংযোগ সর্বপ্রকার জ্ঞানের প্রতি কারণ হয়, কিন্তু ইন্দ্রিয়ার্থসন্নিকর্ষ শুধুমাত্র প্রত্যক্ষ জ্ঞানের প্রতি কারণ হয়। আবার ইন্দ্রিয়মনঃসংযোগ প্রত্যক্ষের প্রতি কারণ হলেও সর্বপ্রকার প্রত্যক্ষের প্রতি কারণ হয় না। সুখ-দুঃখ ইত্যাদি গুণের প্রত্যক্ষে বহিরিন্দ্রিয়ের প্রয়োজন না থাকায় সেখানে ইন্দ্রিয়মনঃ সংযোগ সম্ভব নয়। একমাত্র ইন্দ্রিয়মনঃসংযোগই প্রত্যক্ষের অসাধারণ কারণ হয়। ঐ কারণকে উল্লেখ করে লক্ষণ করাই সঙ্গত হয়েছে।[১৪]

প্রত্যক্ষে ইন্দ্রিয়ার্থসন্নিকর্ষের প্রাধান্য প্রতিপাদন করার জন্য গৌতম দুটি দৃষ্টান্তের উল্লেখ করেছেন। কোন নিদ্রিত ব্যক্তি যখন তীব্র শব্দ শুনে হঠাৎ জাগরিত হয়, তখন যে জ্ঞানটি তার জাগরণের কারণ হয়, সেই জ্ঞানটির প্রতি প্রধান কারণ হয় শ্রবণেন্দ্রিয় এবং ঐ শব্দের সম্বন্ধ। আবার যখন কোন অন্যমনস্ক ব্যক্তির সম্মুখে হঠাৎ কোন পদার্থ উপস্থিত হলে সে ঐ পদার্থটিকে প্রত্যক্ষ করতে বাধ্য হয়, তখন ঐ জ্ঞানের প্রতি ঐ পদার্থটি এবং চক্ষুরিন্দ্রিয়ের সম্বন্ধই প্রধান কারণ। এখানে আত্মমনঃসংযোগ থাকলেও তার কিন্তু প্রাধান্য হয় না। অতএব ইন্দ্রিয়ার্থসন্নিকর্ষেরই উল্লেখ সঙ্গত হয়। অন্যান্য সম্বন্ধের তুলনায় ইন্দ্রিয়ার্থসন্নিকর্ষ যে প্রধান এ বিষয়ে আরও একটি যুক্তি হলো প্রত্যক্ষ জ্ঞানগুলির নামকরণ। যেমন চক্ষুরিন্দ্রেয়ের দ্বারা ঘটের প্রত্যক্ষ হলে সেই জ্ঞানটিকে বলা হয় চাক্ষুষজ্ঞান বা ঘটজ্ঞান। এইভাবে সর্বত্রই ইন্দ্রিয়ের দ্বারা অথবা বিষয়ের দ্বারা প্রত্যক্ষে ব্যপদেশ করা হয়।[১৫]

প্রত্যক্ষের উৎপত্তি বিষয়ে এইসব সংক্ষিপ্ত মন্তব্য ছাড়া প্রত্যক্ষ কোথায় কোথায় সম্ভব হয় এ সম্পর্কেও কিছু মন্তব্য কণাদের সূত্রে পাওয়া যায়। যেমন, দ্রব্যপ্রত্যক্ষের সর্ত উল্লেখ করে চতুর্থ অধ্যায়ের প্রথম আহ্নিকে কণাদ বলেছেন— *'মহত্যনেকদ্রব্যবত্ত্বাদ্ রূপাচ্চোপলব্ধিঃ'*।[১৬] অর্থাৎ যে দ্রব্য মহৎ পরিমাণ বিশিষ্ট হয়, অনেক অবয়বের দ্বারা গঠিত হয় এবং রূপের আশ্রয় হয়, তার প্রত্যক্ষ হতে পারে। যেমন ঘটের প্রত্যক্ষ হয়, কিন্তু পরমাণুর প্রত্যক্ষ হয় না, যেহেতু পরমাণুতে মহৎ পরিমাণ থাকে না। শঙ্করমিশ্র প্রথম দুটি সর্তের প্রত্যেকটিই আবশ্যক কি না এ বিষয়ে বিচার করেছেন। কেউ কেউ মনে করেন, মহৎ পরিমাণের বিদ্যমানতাই যথেষ্ট, অনেক অবয়বের সমন্বয়ে গঠিত এ কথাটি না বললেও চলে, কারণ যে দ্রব্য মহৎ পরিমাণ বিশিষ্ট হয় সেই দ্রব্য অবশ্যই বহু অবয়বের সমন্বয়ে গঠিত হয়। কিন্তু শঙ্করমিশ্রের মতে দুটি সর্তই সমানভাবে প্রয়োজনীয়। যেমন দূরে অতিসূক্ষ্ম সুতোর দ্বারা নির্মিত একখণ্ড বস্ত্রের উপর যদি একটি ক্ষুদ্র মুদ্গর স্থাপিত হয়, তবে মুদ্গরটির প্রত্যক্ষ হয়, কিন্তু বস্ত্রের প্রত্যক্ষ হয় না, যদিও বস্ত্রটিতে মহত্তর পরিমাণ বিদ্যমান আছে। এর দ্বারা সূচিত হয় যে, প্রত্যক্ষে অবয়ববহুত্বেরও উপযোগিতা আছে।

আবার কোন অবস্থায় রূপের প্রত্যক্ষ হয় তা বোঝাতে একটি সূত্রে কণাদ বলেছেন যে, রূপ অনেক অবয়বের দ্বারা গঠিত দ্রব্যে সমবায় সম্বন্ধে থাকে এবং যে রূপেতে বিশেষ ধর্ম থাকে, সেই রূপের প্রত্যক্ষ হয়।[১৭] টীকাকারদের মতে রূপেতে বিদ্যমান বিশেষ ধর্মগুলি হল তিনটি—উদ্ভূতত্ব, অনভিভূতত্ব এবং রূপত্ব।

যে রূপে এই তিনটি বিশেষ ধর্ম থাকে সেই রূপের প্রত্যক্ষ হয়। পরমাণুরূপের প্রত্যক্ষ হয় না। স্পর্শগুণের প্রত্যক্ষ হয় না, কারণ ঐ গুণে রূপত্ব নেই। চক্ষুর রশ্মি বা তার রূপের প্রত্যক্ষ হয় না, যেহেতু ঐ রূপে উদ্ভূতত্ব নেই।

এই প্রসঙ্গে উল্লেখযোগ্য যে, ঠিক একই আকারের একটি সূত্র ন্যায়সূত্রের তৃতীয় অধ্যায়ের প্রথম আহ্নিকে পাওয়া যায়। সূত্রটিতে বলা হয়েছে, যে দ্রব্যের বহু অবয়ব থাকে এবং যার মধ্যে বিশেষ ধরণের একটি রূপ থাকে সেই দ্রব্যের এবং তার রূপের প্রত্যক্ষ হয়।[১৮] ন্যায়সূত্রের ভাষ্যকার বাৎস্যায়ন উদাহরণ দিয়ে সূত্রটির ব্যাখ্যা করেছেন। দ্ব্যণুক নামে একপ্রকার অতিক্ষুদ্র দ্রব্য আছে যার উপাদান বা অবয়ব হয় দুটি পরমাণু। অবয়ব বহু না হওয়ায় দ্ব্যণুক প্রত্যক্ষ হয় না। রূপ, রস, স্পর্শ ইত্যাদি গুণ আবার দুরকম হয়, উদ্ভূত এবং অনুদ্ভূত। উদ্ভূতরূপ ইত্যাদির প্রত্যক্ষ হয়, অনুদ্ভূত হলে ঐ সব গুণের প্রত্যক্ষ হয় না। যেমন ধরা যাক, সূর্যের রশ্মি। তার রূপ উদ্ভূত। অতএব সূর্যরশ্মি চোখেও দেখা যায় এবং তার উষ্ণতাও অনুভব করা যায়। আবার ধরা যাক প্রদীপের রশ্মি। তার রূপ উদ্ভূত, চোখে দেখা যায় কিন্তু তার স্পর্শ অনুদ্ভূত, উষ্ণতা অনুভব করা যায় না। আবার ধরা যাক গরম জলে মিশে থাকা অগ্নিকণা। তার রূপ অনুদ্ভূত কিন্তু স্পর্শ উদ্ভূত। আবার ধরা যাক, চক্ষুর রশ্মি। তার রূপ এবং স্পর্শ দুইই অনুদ্ভূত। এইভাবে তেজ পদার্থ নানাপ্রকারের হতে পারে এবং তাদের গুণের প্রত্যক্ষ বা অপ্রত্যক্ষও অনুরূপভাবে বুঝে নিতে হবে।[১৯]

কণাদের সূত্রে আরও বলা হয়েছে, রস, গন্ধ এবং স্পর্শের প্রত্যক্ষেও এইভাবে বিশেষ বিশেষ ধর্মের প্রয়োজনীয়তা আছে। যেমন রসের প্রত্যক্ষের সর্ত হল—উদ্ভূতত্ব, অনভিভূতত্ব এবং রসত্ব। সাধারণ সর্ত হিসাবে অনেক অবয়বের সমন্বয়ে গঠিত দ্রব্যে বিদ্যমানতাকেও গ্রহণ করতে হবে। যেমন ঘ্রাণেন্দ্রিয়ে বিদ্যমান গন্ধের প্রত্যক্ষ হয় না, কারণ ঐ গন্ধ উদ্ভূত নয়। একটি ক্ষুদ্র প্রস্তরখণ্ডে বিদ্যমান গন্ধের প্রত্যক্ষ হয় না, যেহেতু ঐ গন্ধ অভিভূত। উষ্ণ জলে তেজের ভাস্বর রূপ এবং জলের শীতস্পর্শ অভিভূত হওয়ায় প্রত্যক্ষ হয় না। সুবর্ণের ক্ষেত্রে রূপ উদ্ভূত হলেও তার শুক্লতা ও ভাস্বরতা মিশ্রিত পার্থিব উপাদানের পীতবর্ণের দ্বারা অভিভূত হওয়ায় প্রত্যক্ষ হয় না।

গুণ, কর্ম ও সামান্যের প্রত্যক্ষ বিষয়ে সংক্ষেপে সর্তের উল্লেখ করা হয়েছে। যদি এই পদার্থগুলি প্রত্যক্ষযোগ্য কোন দ্রব্যে বিদ্যমান হয় এবং যদি সেই দ্রব্যটির সঙ্গে চক্ষুরিন্দ্রিয়ের সন্নিকর্ষ হয়, তবে ঐ গুণ ইত্যাদির প্রত্যক্ষ হয়। ঐ সব পদার্থের সঙ্গে সাক্ষাৎভাবে ইন্দ্রিয়ের সম্বন্ধ হয় না, সম্বন্ধ হয় আশ্রয় দ্রব্যের মাধ্যমেই। আত্মার প্রত্যক্ষ হয় কিনা এই বিষয়ে মতভেদ দেখা যায়। অনেকে মনে করেন আত্মার প্রত্যক্ষ হয় না, অনুমানের দ্বারাই আত্মার অস্তিত্ব সিদ্ধ হয়। সাধারণতঃ বলা হয় প্রত্যেকের নিজ নিজ আত্মার প্রত্যক্ষ হয়, কিন্তু পরদেহে বিদ্যমান আত্মাকে অনুমানের দ্বারাই কেবল জানা যায়। তবে বৈশেষিকসূত্রে অন্ততঃ একটি সূত্র পাওয়া যায়, সেখানে আত্মার প্রত্যক্ষের কথা বলা হয়েছে। অবশ্য এই প্রত্যক্ষ একপ্রকার মানস প্রত্যক্ষ এবং বিশেষ একপ্রকার আত্মমনঃসংযোগের দ্বারা উৎপন্ন হয়। শঙ্করমিশ্র মনে করেন এই প্রত্যক্ষ শুধুমাত্র যোগীদের পক্ষে সম্ভব এবং কদাচিৎ সাধারণ ব্যক্তির পক্ষে সম্ভব, যদিও সেক্ষেত্রে অবিদ্যার দ্বারা তিরস্কৃত হওয়ায় সেই প্রত্যক্ষ অসৎকল্প। দ্বিতীয়তঃ এই আত্মমনঃসংযোগের বৈশিষ্ট্য হল যোগজন্য ধর্মের দ্বারা অনুগ্রহ।

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তথ্যসূত্র :

[১] ন্যায়সূত্র, ১/১/৩।
[২] বৈশেষিকসূত্র, ৩/১/১৮।
[৩] ঐ, ৩/২/১।
[৪] ঐ, ৫/২/২৫।
[৫] ঐ, চন্দ্রানন্দরচিত বৃত্তিসহ, সং মুনি জম্বুবিজয়, পৃঃ ১৬৯।
[৬] ঐ, পৃঃ ১৭৪।
[৭] ঐ।
[৮] ন্যায়সূত্র, ১/১/৪।
[৯] ঐ।
[১০] ঐ, ২/১/২১ - ২/১/২২।
[১১] ঐ, ২/১/১৩।
[১২] ঐ, ২/১/২৪।
[১৩] ঐ, ১/১/৬।
[১৪] ঐ, ২/১/২৬।
[১৫] ঐ, ২/১/২৭।
[১৬] বৈশেষিকসূত্র, ৪/১/১৬।
[১৭] ঐ, ৪/১/৭।
[১৮] ন্যায়সূত্র, ৩/১/৩৮।
[১৯] ঐ।

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SUBJECTIVITY, TRANSGRESSION AND RESISTANCE: RETHINKING THE IDEA OF FEMALE DOMESTIC SPACE OF INDEPENDENT BENGAL

Shyamal Mondal
Mahishdal Raj College
West Bengal, India

Abstract:

Subjectivity, Transgression and resistance are the perpetual conditions in human existence. The construction of individual identity as a defense mechanism to get a space in patriarchal hegemony is vividly portrayed by Mahasweta Devi in her renowned seminal work Mother of 1084 (Hazard Churasir Maa). In this Independent system, Virginia Wolf's A Room of One's Own has become ' No Room of One's Own' where any attempt to break it, challenge it, question it, or speak the truth against the status quo is violently suppressed, dominated and subdued. Importantly Foucault's idea of Transgression establishes a scenario for the analysis of the oppressive and transgressive women under a patriarchal hegemony in the literary text, Mother of 1084. Mahasweta Devi's Mother of 1084 sets the situation with transgression and its representation in theatrical performance and in Indian English literature.

Keywords: Subjectivity, Transgression, Indigenous Identity, and Hegemony.

Introduction

"The history of men's opposition to women's emancipation is more interesting perhaps than the story of that emancipation itself.". (P- 46)

The modernist twentieth century prolific writer Virginia Wolf does not hesitate to talk about woman's emancipation in her seminal extended essay 'A Room of One's Own'.' Actually the idea of uprising of the subjugated woman is crystal clearly portrayed in the writings from all over the world- in the writings of once colonized nations like Africa, the Carribeans, south east part of Asia and of colonizing nation's like England (Virginia Wolf, Emily Bronte) France (Simon De Beauvoir) and America (Judith Butler). They have consistently showed through the lens of unimpeachable realism the status of woman as a questioning subjects. In this established power structure of gender binary system, Virginia Wolf's A Room Of One's Own has become a 'No Room Of One's Own' where any attempt to break it, challenge it, question it or speak against the status quo is violently suppressed, and dominated. The historical, social and existential questions of woman is represented not only in the western Culture and literature but in Indian/Bengali Literature as well. The works of Bankimchandra, Tagore, Sarat Chandra have established the convention of portraying woman in literature as a Self sacrificing Devi or 'Other' and the witch or dinner. Asapurna Devi focuses on one the common Indian phenomenon in the 19th century- widowhood. The Hindu window now occupies a crucial place in the canonical texts of modern Indian Literature. Similarly, Mahasweta Devi picturizes the Indian politics of domesticity and the social attitudes towards women with their extraordinary literary effort. In my paper I would like to reconceptualize the idea of Female Domestic space in Independent Bengal through Mahasweta Devi's watershed literary work Mother of 1084.

The issues of power, identity and the female domestic space and the history of gender injustice are efficiently expressed in Mahasweta Devi's Mother of 1084. In September 1973 for the October issue of the Periodical ' Prasad' Devi wrote the first version of Hajar Churasir Maa (Mother of 1084). The narrative predominantly points out the psychological and emotional trauma of a mother who gets a horriable news in the morning that her beloved son Brati is lying dead in the police morgue, reduced to a mere number: corpse no -1084. This situation moves her to a journey of discovery in the course of which she tries to understand her Naxalite son's revolutionary commitment and her own alienation as a woman, wife and mother in the so called bourgeoisie 'bhadralok' society.

Women's subjectivity, Transgression and resistance are the perpetual condition in human existence. It is quite evident in the construction of individual identity as a defense mechanism to get a space in the patriarchal middle class society may be seen a beginning of a social revolution. In the story, Sujata Chatterjee, mother of Brati, is a traditional apolitical upper middle class educated lady. She starts the revolution by educating herself and pursuing B.A. degree in a conservative family. Interestingly the members of the family thinks that education benefits her marriage proposal and finally married to Dibyanath Chatterjee, a chartered accountant belonging to a 'bhadralok' bourgeois Calcutta family. In the 34 years of marriage life, Sujata becomes mother of four children, two sons (Jyoti and Brati) and two daughters (Nipa and Tuli). So women in a domestic household of Independent Bengal is fit only for marriage and reproduction. The only aim of mother of a mother is to look after the household and bring up children efficiently. But after Brati's death, Sujata goes on to discover her life again with a vision of new Ideology. She emerges throwing all the pretensions to hypocritical social respectability and challenging the hegemonic notions of 'bhadralok' domestic family and she claims a space for her own. According to

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As she returns from her day long Odyssey and confronts Dibyanath for the first time courageously breaking the silence, ' Her Words hit him like a whiplash. Dibyanath went out tamely wiping the nope of his neck"(P-16) . The idea of breaking the silence is reminiscent of a great Postcolonial writer's canonical text, 'Can The Subaltern Speak'? where Spivak presents a complex concept of the subaltern woman who are unable to utter words for themselves. Here Sujata becomes brave enough to talk about her dead son and for herself. Nadini's political and ideological commitment and analytic understanding give her encourage to face the harsh reality of 'bhadralok' consciousness. The ideas of rebellion, power, betrayal and also revolutionary optimism have become obvious to Sujata only because of another rebellious and transgressive woman, Nandini. In this context, it is necessary to mention Foucault's idea of Transgression in " A Preface to Transgression" in the book Language, Counter-memory, Practice: Selected Essays and Interviews (1977). He writes,

> " Transgression is an action which involves the limit, that narrow zone of line where it displays the flash of its passages, but perhaps also it's entire trajectory, even it's origin; it is likely that Transgression has its entire space in the line it crosses…. Transgression incessantly crosses and re-crosses a line which close up behind it in a short duration, and thus. It is made to return one more right to horizon of the un-crossable".(P-33-34)

Foucault points out that limit and Transgression are related to each other for if the limit was not crossable it would not be a transgressive act and vice versa. Transgression is an affirmation of the existence of limitless zone where an individual can get freedom to move ahead.

Yes, Sujata moves ahead to get her freedom of inner self. But unfortunately she loses all her hope to live a domestic life due to tragic death of Brati. She says, "Now Brati is dead, I too wouldn't like go on living."(P-127) The moment she screams and collapses on the ground, Dibyanath simply says that her " appendix has burst"(128). It is the death that unites Sujata and Brati who stands against the complacent hypocritical bourgeois society and it's rituals, customs, and thoughtless social tyranny.

Mahasweta Devi's social realism and observation of Sujata as She-hero is significantly noteworthy because she represents Sujata's emancipation from a suppressed, marginalized and mechanical woman in a domestic household to one who desires to have a voice amidst the silences of the voiceless women and their world.

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A Discourse on Patachitra Art with narratives and songs in religious and cultural Scenario of West Bengal.

Shyamal Mondal

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Abstract: India, with its colonial history and contemporary postcolonial culture offers an elaborate arena for the interpretation of the Patachitra art form of different states- Odisha, Bihar, Jharkhand and most importantly west Bengal. Although through the rise of Edward Said's "Orientalism", it was India which first exercised literary influence on the west, similarly Indian Rural Cultures like patachitra, miniature painting, pottery and other crafts have spread on a global scale. Especially the patachitra of west Bengal with its ethnographic reflections is like to leave a permanent and positive mark on the world.In some historical narratives, miscellaneous studies are conceptualized to reveal the significance of the Patachitra art of Bengal, particularly the Patachitra of East and West Medinipur.

Keywords: Postcolonial culture, ethnographic, orientalism and Patachitra

" Culture is a means of communication, language carries culture and culture carries , particularly through orature and literature, the entire body of values by which we come to perceive ourselves and places in the world."(Thiongo P-16)

The kenyan writer Ngugi wa Thiongo in his canonical essay ' *Decolonising the Mind: the politics of Language in African Literature (1986)* precisely explains the co-existence of language, culture and communication. Culture and language are intimately connected to each other. Patachitra art form is supposed to be the byproduct of the indistinguishable relationship of language and culture.Patachitratradition in Indian socio-cultural scenario is the most significant platform where various modes of communication have merged including visual messages, oral traditions and music. It portrays nature, society and culture with narratives of social transformation, migrations and socio-political and religious reflections through the folk songs. And their identity as Patausbelongs to one particular culture and ethnicity. In this discourse of identity formation, it is often associated with the idea of self conception and self perception. So the term cultural identity obviously refers to an individual sense of self derived from formal or informal membership in a group which transmit and inculcate knowledge, beliefs, values, attitudes and ways of life.

In this perspective, it is noteworthy to mention the ideas expressed in " ***Modernity An Introduction To Modern Societies"*** edited by the Jamaica-born British Marxist sociologist, cultural theorist Stuart Hall who explores some questions about the cultural identity and a crisis of identities. Cultural identity is passing through some transformations. It is shifting from the individual consciousness to collective identity and social identity. The concept of collective identity was first introduced by Freud in his essay *Group Psychology and the Analysis of the Ego*(1921). Freud argues that the individual is always a part of a group. It is also important to note that when a given group is formed , no matter whether it is an ethnic group , a nation or just a crowd the individuals behave uniformly to tolerate the peculiarities of the members of the group and feel themselves to be equal. The difference between social and cultural identity could be made much easier, if the first is related to society while the second is used to refer to culture. So the artists of Patachitra art form consists of a collective identity of a specific culture in West Bengal. The 'Pataus' together form a cultural identity that is highly significant to prove existence in the world of globalization and commercialization.

Therefore, language as culture is the collective memory bank of a people's experiences in history, values and aesthetics that is quite interestingly visible in the creative works of Paatachitra art form. The choice of language and the use of language is important to identify the definition in relation to the entire universe. Thiongo

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Cover Page

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THE DISTINCT CULTURE OF MATUYA: A HISTORICAL PERSPECTIVE AND ANALYSIS

Dr Sujit Mondal
Assistant Professor
Department of History, Mahishadal Raj College
Mahishadal, Purba Medinipur, West Bengal, India

Abstract

One of most imperative revolutions among the Namasudra was the instigation of the new religious sect Matuaism in the middle of the 19th century. Harichand Thakur; a Hindu votary and founder of the Matuya sects of Hinduism, felt that the bakward Hindus were victimized not only socially, economically and educationally but also exploited religiously in Bengal. According to him, the social customs and order were the main barriers before the upliftment of the down-trodden and their freedom of mind. Matuya movement was adopted by Namashudra (chandal). His doctrine is based on three basic principles-'truth', 'love', and 'sanctity' and it treats all people as equal. Harichand Thakur left 12 instructions for matuyas;known as Dvadash Ajva. Cultural aspects of Matuaism are related with ideas, customs and social behavior of the Matuya society. The cultural atmosphere of Matuya developed in association with existing social activities, lifestyle, social customs, rules and regulation. The culture of Matuya is independent from the traditional culture of India.

Keywords: Distinct, Dvadash Ajva, Abatars, Incarnation, Gurugiri, Hari Sabha, Kirtan, Gonsai 'Matam, Kabigan, Haribol, Swayam-Dikshiti, Darshan.

INTRODUCTION

One of most imperative revolutions among the Namasudra was the instigation of the new religious sect Matuaism in the middle of the 19th century. Harichand Thakur; a Hindu votary and founder of the Matuya sects of Hinduism (the son of Jasabanta Thakur and Annapurna Devi) was born in a Namasudra family of Safala Danga village in the district of Gopalgunj (Greater faridpur; now in Bangladesh),on the auspicious day of Madhukrishna Traodashi Tithi in 1812 A.D. (the day is logical and reasonable to Bengalee; 1218 Bengali year).He for the first time ,felt that the bakward Hindus were victimized not only socially, economically and educationally but also exploited religiously in Bengal. In these circumstances, he took an initative step for protest against social injustice at first, he did not protest against social injustice directly but introduced a new religious sect for religious liberty for the down-trodden Hindu in Bengal. He realised the imperativeness of religious reformation for the down-trodden people who were deprived of various rights for centuries due to the existence of traditional social customs and order based on social inequality in Hinduism. According to him, the social customs and order were the main barriers before the upliftment of the down-trodden and their freedom of mind.

Different types of works performed and developed with the help of 'Matuya Religion' for Namashudra and other downtrodden people of society. It performed social and cultural reformation, establishment of a newly distinct religion, development in agriculture, economy, familial lives, human moralities, reservation in educations, services and in elections etc and development of social status, respect, position and honour. These become very essential for different types social positions and because of classification of society and professions. In every caste, there are distinction and have restriction about food habits, customs and cultures as well as social marriage system, social rituals.[i]

According to the Yajuveda, the worked and dignity of four castes or classes explained. The Brahmins set up at the highest position of the society on the basis of their work and dignity. The distinction started with in cultures of social arrangement according to the basis of colour or class and it led to create their own culture of every class. After that, these started to appear as distinct categories. As the Brahmins were the highest position in society, lots of rule's regulations and customs depended on them because Brahmins only the main creators of highly cultures, customs and advisers as well as maintainer. As a result of inter-caste marriage, there were formed newly mixtures classes with in social arrangement. In India, there could found another one class who were original inhabitants or natives, known as Santal, Adibashi, Koal Munda, Chandalas. Their social customs, rules and regulations of living cultures, food, habits and social arrangements were totally distinction and we could not find out similarities with them.[ii]

Namasudra, also known as Namassej or Namassut, is an avarna community originating from Southern and Central Bengal. The community was earlier known as Chandala or Chandal, a term usually considered as a slur. As per the Hindu's religious books, the Manusanghita and the Brihaddharma Purana, the chandala is the descendants of illegal sexual union of the Shudra male and the Brahmin female. The term is also used in modern times for a specific caste of agriculturists, fishermen and boatmen, more usually referred to as Namasudra.[iii]

Cover Page

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In the occasion of birthday anniversary of Harichand Thakur at Orakandi in East Bengal erstwhile East Pakistan the Matuyas from different part of India used to throng being divided into many groups of different sizes under the leadership of a Matuya,known as Dalpati(leader) in every group.After the partition of India Thakurbari of Thakurnagar has been organising also such festival in this occasion.Guruchand Thakur felt the neessity of bringing them together on a common platform by which a big group comprising the small ones can be formed to gain adequate strength capable of fighting out all the devils and evils .This big group wastermed later 'Matuya Mahasangha'.Matuya Mahasangha believe in 'Swayam-Dikshiti'(Self-Realisation).Therefore,anyone who has faith in the Darshan or Philosophy of Harichand belongs to Matuya Mahasangha.At first Matuyas formed an organisation at Orakandi district inFaridpur district of Bengal Presidency(now in Bangladesh).After partition ,followers formed a second organisation at Thakurnagar in West Bengal.The temple was initially looked after by Thakur's family,but as of 2011A.D. it was managed by trustee chosen by the followers.[xx]

CONCLUSION

The cultural atmosphereof Matuya developed in association with all theabove existing social activities,lifestyle,social customs,rules and regulation.The culture of Matuya are independent from the traditional culture of India.There exists both similarities and disparities among the inherited culture and the culture developed by the Matuya through their own philosophy.Matuya sangeet containing praises of the God Hari and their gurus Harichand Thakur and Guruchand Thakur.The baul songs are predominantly about love and bhakti.Matuyas ring a trumpet at the time of uttering the name of Hari.They use a red flag with white border to symbolise equalities of social,economic and political.They use a long stick(religious stick) and keep long cotted hairs for their desireless love and the power of devotions.In Matuya religion men and women have equal right in the field of religion as well as in society.They thing that all human being are sacred within this religion.In this religion there is only one name;Lord Hari.

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নীতিবিদ্যা ও নৈতিকতা :
Corruption

বরুন কুমার ঘোষ

অতি সাম্প্রতিককালে আমরা টেলিভিশন, রেডিও, পেপার-পত্রিকা প্রভৃতিতে প্রায়ই দেখতে পাচ্ছি যে পশ্চিমবঙ্গ তথা ভারতবর্ষ তথা সমগ্র বিশ্বে 'Corruption' নামক একটি বিষয় আলোচনার কেন্দ্র বিন্দু হয়ে উঠেছে। এই 'Corruption' হল একটি বিশ্বব্যাপী সমস্যা এবং বিশ্বের কোন দেশ সম্পূর্ণরূপে এই ভয়প্রদর্শনকারী গ্রাস থেকে মুক্ত হতে পারে নি। যাইহোক, একদিক থেকে যেমন এই Corruption-এর ব্যাপকতা দিন দিন বাড়ছে এবং তেমনই অন্যদিক থেকে সৎ, নির্ভীক লোকজন দিন দিন এর সঙ্গে যুক্ত হচ্ছে। এর ফলে বিভিন্ন দেশে বিভিন্নভাবে এই Corruption অনুধাবিত হচ্ছে। ভারতবর্ষের রাজনীতিতে, শিক্ষায়, স্বাস্থ্যে, সভ্য সমাজে, সার্বজনীন, এবং ব্যক্তিগত ব্যবসা-বাণিজ্যে Corruption ওতোঃপ্রতোভাবে জড়িয়ে পড়ছে। আমাদের শিক্ষা ব্যবস্থা, নির্বাচন ব্যবস্থা এবং সামাজিক-অর্থনৈতিক ব্যবস্থাপনা ধীরে ধীরে Corruption-এ দুর্গন্ধপূর্ণ হয়ে পড়েছে। ভারতবর্ষের প্রত্যেক ক্ষেত্রে গভীরভাবে Corruption-এর সংস্কৃতি আবিষ্ট হচ্ছে। তাই ভবিষ্যতে ভারতবর্ষ বিশ্বের Corruption-গ্রস্থ দেশগুলির মধ্যে অন্যতম হয়ে উঠতে পারে।

আমরা প্রায়ই এই Corruption গুলিতে বিদ্রূপাত্মকভাবে মুখোমুখি প্রভাবিত হই। আমরা প্রায়ই এগুলি দেখি যে Corruption-কারীরা আমাদের রাজ্যে রাস্তাঘাট, হসপিটাল, স্কুলের পরিকাঠামো গঠন থেকে শুরু করে সর্বত্র অপরাধের ঢেউ ছড়িয়ে দিচ্ছে। দুঃখের সহিত বলতে হচ্ছে সেখানে অপরাধ দমন করার জন্য কোন তৎপরতা বা প্রতিজ্ঞাবদ্ধতা নেই অথবা কোন শাস্তিবিধানের ব্যবস্থা নেই। আমাদের অনেক Corruption বিরোধী স্লোগান, উদ্যোগ এবং বিভিন্ন প্রতিষ্ঠানের মহতি প্রচেষ্টা হয়ে পড়ে সম্পূর্ণ শূন্য এবং বন্ধ্যা। তাই আমার লেখাটির মূল লক্ষ্য হল নীতিবিদ্যা ও নৈতিকতার আবহে Corruption – নামক কাজটি নৈতিক না অনৈতিক ?

নীতিবিদ্যা ও নৈতিকতার আবহে Corruption – নামক কাজটি আলোচনা করতে গেলে প্রথমেই আমাদের নীতিবিদ্যা ও নৈতিকতা সম্বন্ধে প্রাথমিক ধারণা লাভ এবং সমাজে নীতিবিদ্যা ও নৈতিকতার ভূমিকা সম্বন্ধে প্রাথমিক আলোচনা করা প্রয়োজন। ইংরাজী 'Ethics' শব্দটি এসেছে গ্রীক শব্দ `Ethos' থেকে যার অর্থ 'রীতি-নীতি'।

অনেকে `Ethics' এবং `Moral'-এই শব্দ দুটিকে সমার্থক বলে মনে করেন। `Moral' একটি ল্যাটিন শব্দ যা `Mores' থেকে উৎপন্ন হয়েছে। `Mores' শব্দের অর্থও 'রীতি-নীতি' বা 'অভ্যাস'। তাই ব্যুৎপত্তিগতভাবে বলা যায় যে এই দুটি শব্দের অর্থ হল মানুষের রীতি-নীতি, প্রথা ও অভ্যাস সম্পর্কিত আলোচনা। এজন্য ম্যাকেঞ্জি (Mackenzie) নীতিবিদ্যার সংজ্ঞায় বলেছেন-`Ethics may be defined as the study of what is right or good in Conduct'[১] অর্থাৎ "নীতিবিদ্যা হল আচরণের ঔচিত্য বা ভালত্ব সম্বন্ধীয় বিজ্ঞান"।.. নীতিবিদ্যা সম্পর্কে অধ্যাপক লিলির (Lillie) সংজ্ঞাটি বিশেষভাবে উল্লেখযোগ্য, কেননা সংজ্ঞাটিতে নীতিবিদ্যার মূল বৈশিষ্ট্যগুলির উল্লেখ আছে। লিলির মতে, 'নীতিবিদ্যা হল সমাজে বসবাসকারী মানুষের আচরণ সম্বন্ধীয় এমন এক আদর্শনিষ্ঠ বিজ্ঞান যেখানে মানুষের আচরণ উচিত কি অনুচিত, ভাল কি মন্দ বা অনুরূপ বিচার করা হয়'।[২] এছাড়াও নীতিবিদ্যাকে বলা হয় নীতিদর্শন। কারণ ইহা মানুষের নৈতিক সমস্যা, নৈতিক বিচার এবং মানুষের নৈতিক ক্রিয়া নিয়ে আলোচনা করে। তাই নীতিবিদ্যা সম্পর্কে Uduigwomen বলেছেন "the regulation of the behavior and conduct of man as it affects the overall wellbeing of the state or society in which he lives"।[৩]

আমরা নীতিবিদ্যা ও নৈতিকতার মধ্যে প্রায়ই কিছু শব্দ দেখতে পাই যেমন-নৈতিক, অনৈতিক, নীতিবিগর্হিত। এছাড়াও আমরা দেখতে পাই – নৈতিক ক্রিয়া, ভাল, মন্দ, নৈতিক কর্তা, মূল্য, পছন্দ, অপছন্দ, মানবিক ক্রিয়া ইত্যাদি। আবার নীতিবিদ্যার মধ্যে আমরা দেখতে পাই উপরুক্ত শব্দগুলির মধ্যে সুক্ষ্ম সুক্ষ্ম পার্থক্য খুব সুস্পষ্টভাবে উল্লেখ করা হয়েছে। আমি এখানে কেবল নৈতিক ক্রিয়া, অনৈতিক ক্রিয়া এবং নীতিবিগর্হিত ক্রিয়া নিয়ে আলোচনা করব। কারন আমার আলোচ্য বিষয়টি যেহেতু নৈতিক না অনৈতিক তা বিবেচনা করা। যে ক্রিয়ার ক্ষেত্রে নৈতিক বিশেষণ ভাল-মন্দ ইত্যাদি প্রয়োগ করা যায় তা নৈতিক ক্রিয়া। মানুষের কেবল স্বেচ্ছাকৃত কর্মই নৈতিক। যে ক্রিয়ার ক্ষেত্রে নৈতিক বিশেষণ ভাল, মন্দ ইত্যাদি প্রয়োগ করা যায় না, তা অনৈতিক ক্রিয়া। আবার নীতিবিগর্হিত ক্রিয়া বলতে বোঝায় যা মন্দ, অনুচিত কাজ। মানুষের বাধ্যতামূলক ক্রিয়া অনৈতিক ক্রিয়া।

উক্ত আলোচনার পরিপ্রেক্ষিতে বলা যায় যে নীতিবিদ্যা ও নৈতিকতা প্রত্যেকটি সমাজের জীবনকে প্রতিফলিত করে। ইহার কারন হল সমাজ সবসময় গঠিত হতে চায় নৈতিক গুণসম্পন্ন ব্যক্তিত্বকে নিয়ে, যারা প্রত্যহ ইচ্ছা, রুচি এবং পছন্দ, ভালোত্ব এই গুনগুলি নিয়ে জীবনকে পরিচালিত করে। এই রকম নীতিশাস্ত্র ও নৈতিকতা ছাড়া মনুষ্য সমাজ চালিত হলে তা হবে হবস-এর কল্পিত রাজ্যের মতো, যেখানে একজন মানুষ আর একজন মানুষের পেছনে ধাওয়া হয়েছিল নেকড়ের মতো। সেইজন্য মানুষ হয়ে পড়েছিল জঘন্য, অত্যাচারী এবং নিষ্ঠুর, তাই মানুষের জীবনের প্রত্যেকটি কাজকর্ম মুখোমুখি হয়ে পড়ে নৈতিকতায়, কারণ মানুষের কাজকর্ম শুধুমাত্র নৈতিক মূল্যকে প্রভাবিত

উদ্দেশ্যমুখী নৈতিক মতবাদ অনুসারে, কোন কর্ম বা কর্মনীতি নৈতিকভাবে ঠিক বা বেঠিক তা নির্ধারন করার মানদণ্ড হল নীতিসম্পর্করহিত অনৈতিক কোন মূল্য, যাকে ঐ কর্ম বা কর্মনীতি অনুসরন করে ফলস্বরূপ পাওয়া যেতে পারে, অর্থাৎ মানুষের ইচ্ছাকৃত কর্ম বা কর্মনীতির ফল যদি ভাল হয় তাহলেই ঐ কর্ম বা কর্মনীতির নৈতিক ভালোত্ব স্বীকার করা যাবে। তাই ছ্শসপলঙপস বলেছেন- 'An act ought to be done if and only if it or the rule under which it falls produces .....a greater balance of good over evil than any available alternative'.[৬] আবার "কোন কর্ম বা কর্মনীতিকে 'নৈতিক ভালো' বলা যাবে যদি এবং কেবল যদি ঐ কর্ম বা কর্মনীতি অনুসরন করে অকল্যান অপেক্ষা কল্যানের পরিমান বেশী হয়, যদি তা না হয় তাহলে ঐ কর্ম বা কর্মনীতি নৈতিক দিক থেকে মন্দ"। ফলাফল বা পরিণতির জন্য কোন কর্ম বা কর্মনীতি ভালো বা মন্দ হয়, কর্মের বা কর্মনীতির স্বকীয় মূল্যের জন্য নয়। Corruption নামক কর্মটির ফলাফল বা পরিণতি মন্দ হয় অর্থাৎ সমাজে কল্যাণ অপেক্ষা অকল্যাণ বাশী পরিমানে হয়, তাই কর্মটি অনৈতিক বা মন্দ।

তথাপি খুব সহজভাবে লক্ষ্যনীয় যে, কিভাবে Corruption নৈতিক নিয়মের বিরুদ্ধে যায় ? আমরা দেখতে পাই যে সমাজের উপর Corruption এর একটা খারাপ প্রভাব রয়েছে। বিশেষ করে সমাজের একটা বেশী সংখ্যক মানুষের উপর এটা শেষ পর্যন্ত একটা যন্ত্রণা আরোপ করে।আমরা জানি ভালোর ধারণার মধ্যে আপেক্ষিকতা আছে। আমরা কোন কিছুকে ভালো বলছি শুধু এইজন্য যে তার দ্বারা উদ্দেশ্য সিদ্ধ হবে। সেই উদ্দেশ্য সিদ্ধির পরিপ্রেক্ষিতেই তাকে 'ভালো' বলা হয়। একটি ওষুধ ভালো কারণ তা রোগ নিরাময়ের সহায়ক। রোগের নিরাময় স্বাস্থ্যের সহায়ক। স্বাস্থ্য সুখের সহায়ক। এইভাবে যা ভালো তা সর্বদাই একটি উদ্দেশ্যকে অপেক্ষা করে। এর সঙ্গে তুলনা করে ভালোর আর একটি ধারণা গঠন করা যায় 'Absolute Good' যাকে নিরপেক্ষভাবে ভালো বলা যাবে। যাকে এই অর্থে ভালো বলা যায় তা কোন উদ্দেশ্য সিদ্ধ করে না। তা স্বরূপতঃই ভালো। আমরা তাকে কামনা করি কোন উদ্দেশ্য সিদ্ধির জন্য নয়। তাকে পাবার জন্যই আমরা তাকে কামনা করি'।[৭] এই দৃষ্টিভঙ্গিতে এটা প্রাসঙ্গিক যে, Corruption স্বরূপতঃ ভালো নয়। এটি একটি সাময়িক লাভজনক বিষয়। এটা ব্যক্তিগতভাবে বা সামগ্রিকভাবেও কখনো মানুষকে ভাল কিছু করতে বা ঘটাতে সাহায্য করতে পারে না। Corruption গ্রস্থ মানুষেরা কখনো তাদের ধনসম্পত্তি নিয়ে সম্পূর্ণভাবে সন্তুষ্ট বা সুখী হয় না। ধনী ব্যক্তিরা আরো সম্পত্তি বাড়ানোর কামনায় সবসময় উদ্বিগ্ন থাকে। তাদের যে পরিমাণ ধনসম্পত্তি রয়েছে তাতে সন্তুষ্ট নয়। তাদেরকে যদি সুযোগ দেওয়া যায় তাহলে তারা আরো বেশী পরিমাণ আত্মসাৎ করবে। এই ঘটনার পরিপ্রেক্ষিতে Corruption হল একটি নৈতিকভাবে চরিত্রহীন ও নিন্দনীয় নীতি। এমনকি এটা মানুষকে তার সর্বোচ্চ ভাল কাজ করা থেকে বিরত করতে পারে।

আমরা জানি যে নৈতিকতার দিক থেকে Corruption খুবই খারাপ কাজ।

এটি ক্রমশ আমাদের খুব গভীরে প্রবেশ করেছে, যেটি আমাদের বিপদগামী করে তুলেছে এবং আমাদের ভুল পথে চালিত করেছে। আমরা সহজেই Corruption গ্রস্থ মানুষকে এবং মহৎ মানুষকে পছন্দ করতে পারি। যদি আমরা সহজভাবে Corruption গ্রস্থ মানুষকে পছন্দ করি তাহলে আমরা শীঘ্রই বিপদগামী হব এবং খারাপ কাজে নিজেদেরকে নিয়োজিত করবো। সেই সময় আমরা দেখতে পাব Corruption এর বিষম ফল এবং নৈতিকতার মধ্যে একটা টানাপোড়েন।

সবশেষে বলা যেতে পারে যে আমরা সভ্য সমাজের মানুষ হিসাবে যখন কোন কাজ করছি তখন আমাদের লক্ষ্য রাখা দরকার যে আমার কাজটি নৈতিকভাবে সমর্থনযোগ্য কিনা। যে কাজগুলি সমাজের পক্ষে ক্ষতিকারক বা অন্যায় কাজ সেই কাজগুলি সম্পাদন করা থেকে যেন আমরা বিরত থাকি। আমরা প্রত্যেকেই যদি সচেতনভাবে আমাদের কাজকর্মগুলি সম্পাদন করি তাহলে ভবিষ্যতে আমাদের সমাজ বিশ্বের একটি অন্যতম সভ্য সমাজে পরিণত হবে। কিন্তু তা না করে যদি আমরা আমাদের মতো করে কাজ করি তাহলে এই দেশ তথা ভারতবর্ষ ধীরে ধীরে কিছু অসাধু মানুষের কুক্ষিগত হয়ে পড়বে এবং ধীরে ধীরে সমাজের অবক্ষয় হতে থাকবে। এর ফলে এই ভারতবর্ষ বসবাসের অযোগ্য হয়ে যাবে।

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