

SCHOOL OF PHYSICAL SCIENCES

Dean : Prof. M. K. Mahanti

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The School of Physical Sciences comprises the Departments of Chemistry, Mathematics, Physics and Statistics and the Centre for Science Education. In the four Departments there are 49 faculty members and approximately 105 students are admitted each year. This provides an ideal faculty to student ratio for the pursuit of teaching, and fosters meaningful interactions between students and teachers. Each Department has well-equipped laboratories, computer networking and internet facilities. Each Department has its own identified thrust areas of research, which also encompass areas of inter-disciplinary nature, thus contributing to extensive academic collaboration of our Faculty with national and international institutions. An important feature of the academic programmes includes the visits by faculty members from various institutions for giving lectures and for research interaction. The research output of the faculty has been substantial, and this has resulted in the recognition of the Departments through Special Assistance Programme (DSA) of the UGC, and by DST (FIST), as well as individual faculty research projects funded by UGC, DST, CSIR, NEC and NBHM. The research work has been published in journals of high repute, and the faculty members have been regularly invited to speak at national and international conferences. In addition to teaching and research at the M.Sc., M.Phil. and Ph.D. levels, the School also conducts refresher courses for University and College teachers, organizes study tours for our students to visit research institutions, and imparts training to college and school students in preparation for the Mathematics Olympiad at the regional and national levels. The Centre for Science Education conducts regular remedial coaching programmes in Science subjects for the benefit of SC/ST students.

DEPARTMENT OF CHEMISTRY

Head : Professor R.K. Poddar (till 16th February, 2006)

Professor R.H. Duncan Lyngdoh (from 17th February 2006)

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Thrust areas of Research : Chemical Dynamics, Chemistry of Surfactants, Theoretical Reaction Kinetics, Dynamics of Excited States, Photocatalysis, Natural Products, Heterocyclic Chemistry, Theoretical Organic Chemistry, Coordination Chemistry, Organometallic Chemistry.

Brief statement of Academic Activities : The Department offers M.Sc. and Ph.D. Programmes. 31 M.Sc. and 5 Ph.D. students were admitted to the

Department during the current year. 3 Students were awarded Ph.D. degree. Two students qualified CSIR/UGC NET examination whereas 03 qualified CSIR/UGC NET Lecturership examination. UGC has continued its support to the Department under the SAP-DSA programme during this year. There are individual research schemes funded by agencies such DST, NEC, UGC and CSIR.

Faculty:

- Professors : M.K. Mahanti, M.Sc. (Madr.), Ph.D. (Berh.)
K. Ismail, M.Sc./Ph.D. (AMU)
R.K. Poddar, M.Sc./Ph.D. (IIT Kanpur)
B. Myrboh, M.Sc./Ph.D. (NEHU)
R.H. Duncan Lyngdoh, M.Sc. (NEHU), Ph.D. (IIT Madr.)
R.A. Lal, M.Sc./Ph.D. (BHU)
- Readers : A. Lemtur, M.Sc./Ph.D. (NEHU)
K. Mohan Rao, M.Sc. (S.V), Ph.D. (IIT Kanpur)
Dr. A.K. Chandra, M.Sc./Ph.D. (Burdwan) •
- Lecturers : S. Aravamudhan, M.Sc. (S.V), Ph.D. (IIT Kanpur)
T.S.B.Baul, M.Sc. (Jabalpur), Ph.D. (N. Bengal)
R.L. Nongkhlaw, M.Sc./Ph.D. (NEHU)
E.K. Rymmai, M.Sc. (NEHU)
D.P.S. Negi, M.Sc. (Roorkee), Ph.D. (IIT Roorkee)
S. Mitra, M.Sc. (Vidya Sagar), Ph.D. (IACS, Jadavpur)
H. Askari, M.Sc./Ph.D. (AMU, Aligarh)
M.K.Sahoo, M.Sc. (Utkal), Ph.D. (Czechoslovakia)

Visiting Professors/Fellows/Scholars in the Department :

- (i) Prof. P.J. Das, Department of Chemistry, Gauhati University visited the Department during 22-24 June 2005 to conduct the M.Sc. Practical examination in Organic Chemistry.
- (ii) Dr. Dipar Kr. Palit, Radiation Chemistry & Chemical Dynamics Division, Chemistry Group, BARC, Mumbai, visited the Department on 26th May 2005 and gave a seminar on "Femtochemistry: Exploring the Dynamics of Light Induced Ultrafast Molecular Process".
- (iii) Prof. Dulal C. Ghosh, Department of Chemistry, University of Kalyani, Kalyani visited the Department on 26th October 2005 and gave a Seminar on "Computation of Quantum Mechanical Hybridization & Dipole correlation of the electronic structure of molecules F_3B-NH_3 , H_2O ".
- (iv) Prof. Edward R.T. Tiekink, Department of Chemistry, The University of Texas, U.S.A. visited the Department on 19th December 2005 and gave seminars on (i) Bismuth thiolates: Pharmaceutical use and Development & (ii) Exploiting stoic bulk of ligands as a new design element in crystal Engineering".
- (v) Prof. K. Natarajan, Department of Chemistry, Bharathiar University, Coimbatore Visited the Department on 23rd March 2006 and gave a seminar on "Coordination behaviour of thiosemicarbazones".

Student Intake : a) Enrolment capacity: M.Sc.: 32 From
 b) Actual Admission : SC/ST/OBC/Genl. Male/Female Meghalaya/outside
 M.Sc.: - 23 - 08 19 12 24 07
 Ph.D.: - 02 01 02 03 02 01 04

Degrees Awarded : ST Gen Male Female Total
 M.Sc.: 17 07 10 14 24
 Ph.D.: 01 02 03 -- 03

R. Lalrempuia, "Synthesis, Characterization and Reactivity Studies of Arene and Cyclopentadienyl Complexes of Ruthenium(II) and Osmium(II)".
 Supervisor : Dr. K.M. Rao.

P. Govindaswamy, "Synthesis, Characterization and Reactivity Studies of Cyclopenta-dienyl and Arene Complexes of Some Platinum Group Metals".
 Supervisor : Dr. K.M. Rao.

P. Munindro Singh, "Theoretical Aspects of Intramolecular Diels-Alder Reactions, Sigmatropic Hydrogen Shifts and Degenerate Cope Rearrangements". Supervisor : Professor R.H.D. Lyngdoh.

Placement of Students : Two M.Sc. students joined Chembiotek Research Internation (P) Ltd., as Project Fellows. Students passing out from this Department are placed as Teachers in Colleges, Scientists in research organizations and as research scholars in the Department and elsewhere.

Courses conducted :

Semester I – Inorganic Chemistry-I, Organic Chemistry-I, Physical Chemistry-I, Quantum Chemistry, Laboratory Course in Physical Chemistry.

Semester II – Inorganic Chemistry-II, Organic Chemistry-II, Physical Chemistry-II, Chemical Binding and Molecular Spectroscopy, Laboratory Course in Organic Chemistry.

Semester III – Inorganic Chemistry-III, Organic Chemistry-III, Physical Chemistry-III, Applications of Spectroscopic Methods, Laboratory Course in Inorganic Chemistry.

Semester IV – Environmental Chemistry, Computer Programming in Chemistry, Elective Courses: Bioinorganic Chemistry, Organometallic Chemistry, Natural Products Chemistry, Liquid State Chemistry; Project work (Inorganic/Organic/Physical).

Seminars/Conferences/Symposia/Extension Programmes, etc. :

Organised

A one day National Seminar on "Emerging Trends in Chemistry" was organized by the Department of Chemistry on 18th May 2005. Speakers for the Seminar were invited from institutes of national importance, namely, Indian Association for the Cultivation of Science, Kolkata, Indian Institute of Science, Bangalore and Tata Institute of Fundamental Research, Mumbai. The

Seminar was inaugurated by Professor Mrinal Miri, Vice-Chancellor, NEHU. The list of distinguished speakers who came and participated is given below:-

Prof. D. Mukherjee, Director, Indian Association for the Cultivation of Science, Jadavpur, Kolkata, (2) Prof. S. Natarajan, Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore, (3) Prof. B.C. Ranu, Department of Organic Chemistry, Indian Association for the Cultivation of Science, Jadavpur, Kolkata, and (4) Prof. G. Krishnamurthy, Department of Chemical Sciences, Tata Institute of Fundamental Research, Mumbai.

Eighty five participants including Teachers, Research scholars and M.Sc. students of the Department attended the Seminar. The programme of the Seminar was spread over the whole day of 18th May 2005.

This Seminar has been able to enthuse the teachers, research scholars and the M.Sc. students towards newer programmes of research in Chemistry. Research work in some of the areas as described by the invited Scientists is likely to be initiated in the department. Over all, the Seminar has given a boost to the research atmosphere in the department.

Attended

Prof. M.K. Mahanti attended the Annual Session of the Indian Council of Chemists held at Birla Institute of Technology, Ranchi, during December 16-18, 2005 and presented a paper entitled "Kinetics of the oxidative Cleavage of Ketones by Quinolinium Dichromate.

Prof. K. Ismail attended the 12th National Conference on Surfactants, Emulsions and Biocolloids held at Manipur University, Imphal on November 9-11, 2005 and delivered Invited Talk on "Micellization of AOT"

Mr. O. Gobin Singh (Supervisor Professor K. Ismail) attended the 12th National Conference on Surfactant, Emulsions and Biocolloids held at Manipur University, Imphal on November 9-11, 2005 and presented a paper entitled "Micellization Behaviour of Mixtures of AOT with SDS".

Publications :

Published in India

Dkhar, P.G.S., Lyngdoh, R.H.D. 2005. Transition States for Hydride and Methyl 1,2-Migrations in Carbene Rearrangements to Alkenes: An AMI SCF-MO Study. *Indian Journal of Chemistry*, 44B : 2138-2148.

Lal, R.A., Basumatary, D., Chakraborty, J., Bhaumik, S. and Kumar, A. 2006. Binuclear and Tetranuclear Dioxouranium(VI), Zinc(II) and Copper(II) Complexes Derived from bis (2-hydroxy-1-naphthaldehyde) malonyldihydrazone. *Indian Journal of Chemistry*, 45A, 619-628.

Mukhim, T. and Ismail, K. 2005. Micellization of Cetylpyridinium Chloride in Aqueous Lithium Chloride, Sodium Chloride and Potassium Chloride Media. *Journal of Surface Science and Technology*, 21: 113-127.

Nongkhlaw, R.L., Nongrum, R., Nongkynrih, L., Mathew, V.F. and Myrboh, B. 2005. Novel Synthesis of Substituted Cyclopropane Acetic Acid Ethyl Esters from Cyclopropyl Alkyl Ketones. *Indian Journal of Chemistry*, 44B: 1054-1057.

Published abroad

Baul, T.S.B., Masharing C., Basu, S., Rivarola, E., Holčapek, M., Jirásko, R., Lycka, A., de Vos, D., Linden, A. 2006. Synthesis, characterization, cytotoxic activity and crystal structures of tri- and di-organotin(IV) complexes constructed from *beta*-{[(*E*)-1-(2-hydroxyaryl)alkylidene]amino}propionate and *beta*-{[(*Z*)-(3-hydroxy-1-methyl-2-butenylidene)]amino}propionate skeleton. *J. Organomet. Chem.*, 691: 952-965.

Baul, T.S.B., A. Mizar, X. Song, G. Eng, R. Jirasko, M. Holcapek, R. Willem, M. Biesemans, I. Verbruggen, R. Butcher. 2006. Dibenzyltin(IV) complexes of the 5-[(*E*)-2-(aryl)-1-diazenyl]quinolin-8-olates: Synthesis and an investigation of structures by X-ray diffraction, solution and solid-state tin NMR, ¹¹⁹Sn Mossbauer and electrospray ionization MS. *J. Organomet. Chem.*, 691: 2605-2613.

Baul, T.S.B., Masharing C., Willem, R., Biesemans, M., Holčapek, M., Jirásko, R., Linden, A. 2005. Self-assembly of diorganotin(IV) 2-{[(*E*)-1-(2-oxyaryl)alkylidene]amino}acetates: An investigation of structures by X-ray diffraction, solution and solid state tin NMR, and electrospray ionisation MS. *J. Organomet. Chem.*, 690: 3080-3094.

Baul, T.S.B., Singh, K. S., Holčapek, M., Jirásko, R., Linden, A., Song, X., Zapata, A., Eng, G. 2005. Electrospray ionization mass spectrometry of tributyltin(IV) complexes and their larvicidal activity on mosquito larvae; crystal and molecular structure of polymeric (Bu₃Sn[O₂CC₆H₄{N=N(C₆H₃-4-OH(C(H)=NC₆H₄OCH₃-4))}-o])_n. *Appl. Organomet. Chem.*, 19: 935-944.

Baul, T.S.B., Singh, K. S., Holčapek, M., Jirásko, R., Rivarola, E., Linden, A. 2005. Synthesis, characterization and crystal structures of polymeric and dimeric triphenyltin (IV) complexes of 4-[(*E*)-1-{2-hydroxy-5-[(*E*)-2-(2-carboxyphenyl)-1-diazenyl]phenyl} methylidene) amino]aryls. *J. Organomet. Chem.*, 690: 4232-4242.

Baul, T.S.B., Rynjah, W., Singh, K. S., Pellerito, C., D'Agati, P., Pellerito, L. 2005. Embryotoxicity studies of tributyltin(IV) complexes of 5-[(*E*)-2-(aryl)-1-diazenyl]-2-hydroxybenzoic acid and 2-[(*E*)-2-(3-formyl-4-hydroxyphenyl)-1-diazenyl]benzoic acid on sea urchin development. *Appl. Organomet. Chem.*, 19: 1189-1195.

Chaubey, G. S., Suante, H. and Mahanti, M.K. 2005. Kinetics of oxidation of long - chain aliphatic aldehydes by quinolinium dichromate. *Oxidation ommunications*, 28 : 352 - 360.

Chandra, A.K. and Th. Zeegers-Huyskens. 2005. Theoretical Study of (CH...C) Hydrogen Bonds in CH_{4-n}X_n(X = F, Cl; n = 0, 1, 2) Systems Complexed with their Homoconjugate and Heteroconjugate Carbanions. *J. Phys. Chem. A* 109: 12006-12013.

Das, S., Nongkynrih, T., Chaubey, G. S. and Mahanti, M.K. 2005. Kinetics and mechanism of oxidation of 2 - alkanones by quinolinium dichromate. *Oxidation Communications*, 28 : 90 - 98.

Das, S., Rani, E. R. and Mahanti, M.K. 2005. Kinetics of the oxidative cleavage of arylalkyl ketones by quinolinium dichromate. *Oxidation Communications*, 28 : 361 - 368.

Dkhar, P.G.S., Lyngdoh, R.H.D. 2005. Ring expansions in substituted phenylnitrenes: an AM1 SCF-MO study *Journal of Molecular Structure: THEOCHEM* 732, 161-171.

Suante, H., Siamkhanthang, N., Lalnundanga and Mahanti, M.K. 2005. Kinetics and mechanism of the oxidation of substituted benzoic acids by quinolinium dichromate. *Oxidation Communications*, 28 : 99 - 107.

Suante, H. and Mahanti, M.K. 2005. Kinetics and mechanism of the oxidation of thioacids by quinolinium dichromate. *Oxidation Communications*, 28 : 675 - 680.

Suante, H. and Mahanti, M.K. 2005. Kinetics of the oxidation of salicylic acids by quinolinium dichromate. *Oxidation Communications*, 28 : 681 - 688.

Suante, H. and Mahanti, M.K. 2005. Kinetics and mechanism of the oxidation of glutaric and adipic acids by quinolinium dichromate. *Oxidation Communications*, 28 : 689 - 694.

Suante, H. and Mahanti, M.K. 2005. Kinetic studies on the quinolinium dichromate oxidation of heteroacids. *Polish J. Chemistry*, 79 : 1813 - 1819.

Suante, H. and Mahanti, M.K. 2005. Kinetics of the quinolinium dichromate oxidation of pyridinecarboxylic acids. *Oxidation Communications*, 28 : 903 - 909.

Suante, H. and Mahanti, M.K. 2005. Steric effects in the oxidation of substituted benzoic acids by quinolinium dichromate, *Oxidation Communications*, 28 : 910 - 918.

Sarma, G.C. and Mahanti, M.K. 2005. Oxidation of fluorene by quinolinium dichromate : Evidence for the chromium(V) species. *Oxidation Communications*, 28 : 919 - 922.

Singh, K.S., Mozharivskyj, Y.A. Carsten Thone, Mohan Rao Kollipara, 2005. New mononuclear ruthenium complexes of n^5 -cyclichydrocarbon containing azineligands: Syntheses, spectral and structural studies. *J. Organomet. Chem.* 390: 3720.

Singh, K.S., Carsten Thone, Mohan Rao Kollipara, 2005. Part-1: 1-3-dipolar addition of activated alkyne towards coordinated azido group in ruthenium(II) complexes containing n^5 -cyclichydrocarbons. *J. Organomet. Chem.* 690: 4222.

Singh, K.S., Kreisel, K.A., Yap, G.P.A., Mohan Rao Kollipara, 2005. Studies of n^5 -Cyclichydrocarbon ruthenium(II) complexes containing para-amino N-(pyrid-2-ylmethylene)-phenylamine ligand: molecular structure of $[n^5\text{-C}_5\text{H}_5\text{Ru}(\text{PPh}_3)(\text{C}_5\text{H}_4\text{NCH}=\text{N-C}_6\text{H}_4\text{-p-NH}_2)]\text{BF}_4$. *J. Coord. Chem.* 58: 1607.

Singh, K.S., Mozharivskyj, Y.A., Mohan Rao Kollipara, 2005. Reactivity studies of n^5 -Cp* ruthenium(II) Complexes towards some polypyridyl ligands. *Z. Anorg. Allg. Chem.* 631: 172.

Linden, A., Basu Baul, T.S., Singh, K. S. 2005. *Ccatena*-Poly[[tri-n-butyltin(IV)]- μ -2- $\{(E)\text{-4-hydroxy - 3 - [(E) - 4 - methylphenyliminomethyl] phenyldiazanyl}\}$ benzoate- $k^2\text{O:O}$ ']. *Acta Crystallogr.*, E61: m2711-m2713.

Mitra, S., Tamai, N. and Mukherjee, S. 2006. Intramolecular proton transfer in 4-methyl-2,6 diformyl phenol and its derivative studied by femtosecond transient absorption-spectroscopy. *J. Photochem. Photobiol. A: Chem.* 178: 76.

Nguyen, H.M.T., Chandra, A.K., Carl, S.A., Nguyen, M.T. 2005. Quantum chemical study of hydrogen abstraction reactions of the ethynyl radical with hydrogen compounds ($\text{C}_2\text{H} + \text{HX}$). *J. Mol. Struct. Theochem* 732: 219-224.

Nam, P.-C., Nguyen, M.T., Chandra, A.K. 2005. The C-H and $\alpha(\text{C-X})$ bond dissociation enthalpies of toluene, $\text{C}_6\text{H}_5\text{-CH}_2\text{X}$ ($\text{X} = \text{F}, \text{Cl}$), and their substituted derivatives: A DFT study. *J. Phys. Chem. A* 109: 10342-10347.

Umlong I.M. and Ismail, K. 2005. Micellization of AOT in Aqueous Sodium Chloride, Sodium Acetate, Sodium Propionate and Sodium Butyrate Media. A Case of Two Different Concentration Regions of Counter Ion Binding. *J. Colloid Interface Sci.*, 291: 529-536.

Funds Received from Agencies other than NEHU/UGC :

Dr. A.K. Chandra "Studies on the Kinetics and Mechanism of Hydrogen Abstraction Reactions of Halocarbons with OH Radicals and Cl atoms" DST, Rs.10.05 Lakhs.

Dr. T.S.B. Baul "Exploration on organotin carboxylates as a viable building block for the constructing homo and hetero-nuclear supramolecules: Synthesis, structures and Biological properties" DST, Rs.9.00 Lakhs.

Dr. D.P.S. Negi "Investigation of Photophysical and photocatalytic properties of colloidal semiconductors" (under SERC Fast Track proposal for Young Scientists) DST, Rs.6.50 Lakhs.

Dr. S. Mitra "Excited state properties and relaxation dynamics of intramolecularly hydrogen bonded azo-derivatives" (2005-06) DST Rs.1.00 Lakh.

Dr. S. Mitra "Spectroscopic characterization of intramolecular charge transfer type polarity sensors & their use in the study of protein-surfactant interaction" CSIR, Rs.2.62 Lakhs.

Department of Chemistry "UGC-DSA SAP Programme" NEHU (2005-2006) UGC, Rs.2.25 Lakhs.

Infrastructure Facilities : One Perkin-Elmer UV-Vis Spectrophotometer has been acquired and installed.

Research Project (Undertaken during the year under review):

Ongoing

"Base-Line environmental studies in and around uranium mining area of Domiasiat" sponsored by DST-DAE (Co-investigator Prof. B. Myrboh).

North-Eastern Biodiversity- An interdisciplinary Research Project extended for the X Plan period (Coordinator: Prof. B. Myrboh) sponsored by NEC, Shillong.

New

- (i) "Studies on the Kinetics and Mechanism of Hydrogen Abstraction Reactions of Halocarbons with OH Radicals and Cl atoms" (Principal Investigator: Dr. A.K. Chandra) sponsored by DST, New Delhi.
- (ii) "Exploration on organotin, carboxylates as a viable building block for the constructing homo and hetero-nuclear supramolecules: Synthesis, structures and biological properties (Principal Investigator: Dr. T.S.B. Baul) sponsored by DST, New Delhi.
- (iii) "Investigation of Photophysical and photocatalytic properties of colloidal semiconductors" (Principal Investigator: Dr.D.P.S. Negi) sponsored by DST, New Delhi.
- (iv) "Spectroscopic characterization of intramolecular charge transfer type polarity sensors & their use in the study of protein-surfactant interaction" (Principal Investigator: Dr. S. Mitra) sponsored by CSIR, New Delhi.

Completed

- (i) Synthesis, structure and reactivity of molybdenum(VI), molybdenum(IV) complexes derived from polyfunctional

dihydrazones (Principal Investigator: Prof. R.A. Lal) sponsored by U.G.C., New Delhi.

- (ii) Co-ion Effect on Micellization of Ionic Surfactants (Principal Investigator: Prof. K. Ismail) sponsored by the DST, New Delhi.
- (iii) Shielding Parameters on Nuclei: Facilities for the Experimental Determination and Calculation by Theoretical Procedures – to Obtain Information on Crystal Structures and Molecular Electronic Structures (Principal Investigator: Dr. S. Aravamudhan) sponsored by CSIR, New Delhi.

Academic/Professional collaborations :

- (i) Prof. R.H. D. Lyngdoh has academic collaboration with Prof. H.F. Schaefer III, (Director, Centre for Computational and Quantum Chemistry), University of Georgia, Athens, Georgia, USA
- (ii) Dr. A.K. Chandra has academic collaboration with the Quantum Chemistry Group of the University of Leuven, Belgium.
- (iii) Dr. T.S. Basu Baul has Research collaboration in the field of organotin(IV) complexes with the (1) Dipartimento di Chimica Inorganica e Analitica "Stanislao Cannizzaro" Università di Palermo, (Italy), (2) University of Pardubice, Department of Analytical Chemistry, Czech Republic Research Institute for Organic Syntheses, (Czech Republic), (3) Pharmachemie BV, Haarlem, The (Netherlands), (4) Institute of Organic Chemistry, University of Zurich, (Switzerland), (5) Department of Chemistry, Howard University, Washington DC, (USA), (6) High Resolution NMR Centre and Department of Polymer Science and Structural Chemistry, Vrije Universiteit Brussel, (Belgium), (7) Department of Chemistry and Physics, University of the District of Columbia, Washington, (USA).

Other Activities:

Prof. K. Ismail visited the UGC-Academic Staff College, Gauhati University, on invitation during September 12-13, 2005 and delivered lectures on Statistical Thermodynamics to the participants of the Refresher Course.

Prof. R.K. Poddar visited the UGC-Academic Staff College, Gauhati University, on invitation during 5-25 September 2005 and delivered lectures on Symmetry and Group theory; its applications in Chemistry to the participants of the Refresher Course.

Prof. R.A. Lal visited the University of Tripura in June 2005 and delivered lectures to the M.Sc. (Chemistry) students on Molecular Symmetry and Group Theory.

Dr. A.K. Chandra was a Visiting Fellow in the Computational Chemistry group of the University of Leuven and Vrije Universitat of Brussels, Belgium during June-July, 2005.

DEPARTMENT OF MATHEMATICS

Head : Professor H.K. Mukerjee.

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Thrust Areas of Research : Algebra, Algebraic and Differential Topology, Cosmology, Number Theory, and Oceanography.

Brief statement of academic activities : The Department conducts M.Sc./M.Phil. and Pre Ph.D. courses of different subjects of mathematics like Algebra, Analysis, Complex Function Theory, Differential Equations, Linear Algebra, Mechanics, Number Theory, Numerical Analysis and Computer Programming, Oceanography, Relativity and Cosmology and Topology.

The Department conducted regular seminar and colloquia on the topics in the thrust areas of research.

Our students continue to perform well in obtaining UGC/CSIR NET Junior Research Fellowship and NET Lecturership.

Faculty :

Professors : S.S. Khare, D.Phil. (All.) (on deputation as PVC-Tura)

M.B. Rege, Ph.D. (Bombay)

S.K. Srivastava, Ph.D. (Gorak.)

H.K. Mukherjee, D.Phil. (All.)

Readers : P.K. Saikia, Ph.D. (Wisconsin)

C.R. Mondal, Ph.D. (V.B)

A.K. Das, Ph.D. (NEHU)

M. Ansari, Ph.D. (Gorak.)

K.K. Singh, Ph.D. (Gorak.)

Lecturers : A.M. Buhphang, M.Phil. (NEHU)

A.T. Singh, M.Phil. (NEHU)

S. Dutta, Ph.D. (NEHU)

J. Choudhury, M.Sc. (Gau.)

Visiting Professors/Fellow/Scholars in the Department : Mr. Nilotpal Sinha of Infosys visited the Department and delivered a talk on "The Prime Number theorem and Riemann Zeta functions".

Student Intake :

Enrolment capacity :

(a) M.Sc. : 33

(b) M. Phil. : unspecified

(c) Ph.D. : unspecified

Actual Admission	SC/ST/Genl.	Male/Female	From Meghalaya/Outside
M.Sc.	- 28 5	24 9	26 7
Ph.D.	- 1 2	3 -	1 2

Degree Awarded	SC/ST/Genl.	Male/Female	Total
M.Sc.	- 5 1	3 3	6

M.Phil.

N. Jiban Singh, "A Survey of the Studies on the Structure of Mapping Class Groups", Supervisor : H.K. Mukherjee.

Shailenstar Khongsit, "A Survey of Some Congruences Modulo Prime and Prime Powers with Special References to Generalizations of Fermat's Little Theorem", Supervisor : Dr. P.K. Saikia.

Kongkamaya Rymbai, "Armendariz Modules and Rings: A Brief Survey", Supervisor : Professor M.B. Rege.

Durkalana Rymbai, "Regularity and AntiRegularity in Algebraic structure: A Brief Survey", Supervisor : Professor M.B. Rege.

Placement of Students: About 5 students got teaching jobs in different colleges of Shillong and Govt. jobs.

Courses conducted : M.Sc.

Semester-I : Linear Algebra, A.M.E.S., Analysis I, Classical Mechanics, O.D.E.

Semester-II : Analysis II, Algebra I, Topology, P.D.E.

Semester-III : Computer Programming, C.F.T., Diff. Geometry, Topics in Algebra.

Semester-IV : E.N.T., C.N.A., Ring Theory, Algebraic Number Theory.

Study tours/Field trips of students: Ms. A.M. Buhphang, Lecturer led a study tour for students to TIFR, Bombay, Institute of Oceanography, Goa, Indian Institute of Science, Bangalore, Indian Statistical Institute, Bangalore, and other places, to get to know the various development in mathematics and its applications and also to know the various opening and direction for the future.

Seminars/Conferences :

Organized

The Department organized weekly Colloquium and Seminars in the topics: Clifford Algebras and Spin groups; some aspects of Linear algebra; Number theory congruences, Character theory of finite groups; Rational Homotopy theory; Mapping class groups and curve complexes.

Prof. M.B. Rege has organized a week-long pre-Indian National Mathematical Olympiad orientation programme in Shillong in December 2005.

Attended

Prof. M.B. Rege delivered eight lectures and participated in the orientation cum selection camp for selecting the Indian team for the International Mathematical Olympiad 2005 held at the Homi Bhabha Centre for Science Education, Mumbai, from 14th May 2005 to 11th June 2005.

Prof. M.B. Rege has delivered three lectures in the nurture programme organized by the Department of Education, NEHU, Shillong in December 2005.

Prof. H.K. Mukerjee delivered three thematic lectures entitled "Why algebraic topology and How?" at the 20th Annual Conference of Ramanujan Mathematical Society, during July 25-30, 2005 at Calicut University, Calicut, Kerala.

Prof. H.K. Mukerjee delivered three lectures entitled "Lectures on the fundamental Group" at the Refresher course at the Gauhati University, Guwahati in February 2006.

Prof. H.K. Mukerjee delivered "Dr. Amala Bezbarua Memorial Technical talk" entitled "Algebraic Topology – an overview" at the Department of Mathematics, Gauhati university, Guwahati, on May 27th, 2005.

Prof. H.K. Mukerjee delivered two lectures entitled "Geometry and Topology" in the nurture programme organized by the Department of Education, NEHU, Shillong in December 2005.

Mr. A. Tiken Singh attended and actively participated in the problem sessions, in the Advance Instructional School in Differential and Algebraic Topology at Indian Statistical Institute, Kolkata, from 5.12.2005 to 31.12.2005.

Prof. S.S. Khare delivered an invited talk titled "On Fractional Calculus" at Delhi University in January 2006.

Publications :

Published in India

Choudhury, J., Saikia, H. and Mishra, K. 2005. On Quasi L-Bounded Near Rings. *Far East Journal of Mathematical Sciences*. 16 (2) : 247-260.

Mondal, C.R. 2005. Shallow-Water Waves Due to Moving Oscillatory Surface Pressure in a layered Fluid of Finite Depth. *Indian Journal Pure Appl. Math. Applied Mathematician*. 36 (10): 579-602.

Published abroad

Srivastava, S.K. 2005. Future Universe with $W < -1$ Without Big-Smash. *Physics Letters B*. 619: 1-4.

Fund received from agencies other than NEHU : National Board of Higher Mathematics, Deptt. of Atomic Energy, Govt. of India, Library grant to Mathematics- Rs. 8,00,000/-.

Infra structure facilitates : Computer Laboratory

Other activities : Prof. S.S. Khare has been chosen as one of the members in the Book writing project of NCERT, New Delhi in February 2006.

DEPARTMENT OF PHYSICS

Head : Professor M.K. Parida (till 31st July 2005)

Professor P. Nongkynrih (w.e.f. 1st August, 2005)

Telephone : 2722801, 2722831 (O), 2225434 (R)

Email : phlism@yahoo.com

Thrust area of research : Solid State Physics, High Energy Physics, Laser Physics and Nuclear Physics.

Brief statement of academic activities : The M.Sc.(Physics) admission capacity has been increased nearly four times compared to the initial strength to meet the growing demand. Besides conducting M.Sc. and Ph.D. programmes, the faculty members have been invited by reputed national and international institutions for research collaborations and giving talks on their research contributions where their works were well recognised. Some members have been offered associateships and senior associate for collaborative research works. The Department has been selected under DST-FIST since July 2001.

Faculty members had participated by giving lectures in different colleges during the celebration of the International Year of Physics 2005. The Department in collaboration with the Indian Association for Radiation Protection (IARP), Mumbai had also organised during Dec. 13-16, 2005 an "Awareness Programme on Radiation" for students of different colleges in Shillong as part of celebration of the International Year of Physics, 2005.

Faculty :

- Professors :** P. Shukla, M.Sc. (IIT, Delhi), Ph.D. (Temple)
K. Kumar, M.Sc. (Agra), Ph.D. (IIT Kanpur)
Y.S. Jain, M.Sc. (Agra), Ph.D. (IIT Kanpur)
P.N.Pandita, M.Sc./Ph.D.(Kashmir)
D.T. Khathing M.Sc. (Delhi), D. Phil (Kolkata)*
M.K. Parida M.Sc./Ph.D.(Utkal)(Retd. 31st July, 2005)
B.M. Jyrwa, M.Sc./Ph.D. (NEHU)
P. Nongkynrih, M.Sc./Ph.D. (NEHU)
- Readers :** M.C. Mahato, M.Sc.(Ranchi), Ph.D.(Bangalore)
S.S. Khatri, M.Sc./Ph.D. (NEHU)
Y.N. Tiwari, M.Sc./Ph.D./LL.B.(Patna)
- Lecturers :** S.S. Pohlong, M.Sc./ Ph.D.(NEHU)
A.Saxena, M.Sc.(Rohil), M.Phil.(Meerut), Ph.D.(NEHU)
*On deputation as Registrar, NEHU, Shillong.
S. Kumar, M.Sc(BHU), Ph.D(Utkal) is temporarily attached.

Visiting Professors/Fellow/Scholars in the Department : Prof. A.P. Balachandran, Department of Physics, Syracuse University, USA visited the Department as TPSC speaker on August 7-10, 2005 and gave a lecture on Non-Commutative Quantum Mechanics.

Student intake : Enrolment capacity: 30

Actual Admission	SC/ST/Gen	Male/Female	From Meghalaya/Outside
M.Sc =	1 18 11	22 8	25 5
Ph.D =	- 1 3	3 1	2 2

Degrees Awarded :

Ph.D.

Thongam Gombi Devi, "Vibrational Band Shape Analysis in Complex Molecular Systems" Supervisor: Prof. K. Kumar.

Courses conducted :

Semester I-Classical Mechanics, Quantum Mechanics I, Mathematical Physics, Laboratory I

Semester II-Electrodynamics, Electronics, Quantum Mechanics II, Laboratory II

Semester III-Nuclear Physics, Solid State Physics, Atomic and Molecular Physics, Laboratory III, Environment

Semester IV-Thermal Physics, Computational Techniques and Numerical Methods, Computational Techniques-Laboratory, Optional papers on Advanced Solid State Physics, High Energy Physics, Laser Physics and Nuclear Physics.

Study tours/field trips : The students of Physics Department under the guidance of Mr. A.K. Rathore, the Senior Technical Assistant went on Study Tour during 18th January to 2nd February 2006 to visit National Institutions of Scientific importance like BARC, Trombay, Mumbai.

Seminars/conferences/symposia/workshops/extension programmes etc. :**Organised**

"Awareness Programme on Radiation" was conducted during Dec. 13-16 2005 for College Students of Shillong with Profs. D.T. Khathing and P. Nongkynrih as organisers in collaboration with Indian Association for Radiation Protection (IARP) Mumbai as part of celebration of International Year of Physics.

Prof. D.T. Khathing, as Chairman of the Local Organising Committee of (National Seminar) Hindi Vigyan Sangoshthi. Hindi Sangoshthi on "*Policy of Self Reliance in Energy : Environmental Protection and Challenges in the North*" held under the aegis of BARC, Mumbai and NEHU, Shillong at NEHU on 23-24, February, 2006.

Prof. D.T. Khathing as the Convener of the Nuclear Science Centre, Delhi and NEHU in organizing "*One Day Nuclear Science Centre Acquaintance Programme*" (Regional) held on 18th July 2005 at NEHU, Shillong.

Dr. S.S. Khatri, as one of the organisers in conducting Physics programmes held on 19th Aug., 2005 and 19th Nov. 2005 at St. Edmund's College to celebrate the International Year of Physics.

Attended

Prof. P.N. Pandita gave an invited talk on "Phenomenology of Non-Universal gaugino Masses and Implications for Higgs Boson Decays" at the Linear Collider Workshop (LCWS06) of the International Linear Collider Working Group held at the Indian Institute of Science, Bangalore during the period 9-13, March 2006 organised by the International Linear Collider Working Group and the Indian Institute of Science, Bangalore.

Prof. P.N. Pandita chaired one of the sessions at the International Conference "Einstein's Legacy in the New Millennium" held during 15-17, December, 2005 at Puri, organised by IUCAA, Pune, IOP, Bhubaneswar and Utkal University, Bhubaneswar, India.

Prof. P.N. Pandita gave an invited talk entitled "Neutrino Masses and Supersymmetry" at the Centre for High Energy Physics, Indian Institute of Science, Bangalore, under the Theoretical Physics Seminar Circuit Programme during the period 5-11, October 2005 organised by the Department of Science and Technology, India.

Prof. P.N. Pandita gave an invited talk entitled "Low Energy Implications of Supersymmetric Unification" at the mid term meeting of the Indian Academy of Sciences, Bangalore during 7-9 July, 2005 organised by the Indian Academy of Sciences, Bangalore, India.

Prof. P.N. Pandita delivered a Special Lecture on "Standard Model and Beyond" at Chennai during the Refresher Course held during the period May 26-June 16, 2005 conducted by the Institute of Mathematical Sciences, Chennai.

Prof. B.M. Jyrwa gave the following talks in connection with the celebration of the International Year of Physics:

"Uses of Radiation and Laboratory at the Undergraduate level" at a Seminar organised by Shillong College.

"Different Types of Radiation" at the Seminar organised by Science and Technology Cell, Meghalaya.

"Myths of Radiation" at the BSF Higher Secondary School, Shillong.

"Improving Physics Education at the Undergraduate level" at Lady Keane Girls' College, Shillong.

Prof. B.M. Jyrwa gave a talk entitled "Role of Higher Education in improving the Society" during the Centenary Celebrations of Shillong College.

Prof. P. Shukla gave a talk entitled "Physics Forever" at Lady Keane Girls' College, Shillong on 15th Dec. 2005 in connection with the celebration of the International Year of Physics.

Publications :

Published in India

Krishna, R. Mahato, M.C. and Jayanavar, A.M. 2005 "Noise Induced Transport and Energetics in Adiabatically Rocked Time Asymmetric Ratchets" *Indian Journal of Physics*, 79:935-937.

Pohlong, S.S. and Ram, P.N. 2005. "Vibrational Density of States of Self-Interstitial Atoms (SIAs) in Metals". *Indian Journal of Physics*, 79:973-977.

Published abroad

Ananthanarayan, B. and Pandita, P.N., 2005 "Probing SO(10) symmetry breaking patterns through fermion mass relations," *International Journal of Modern Physics A20*, 4241.

Chemtob, M. and Pandita, P.N. 2006, "Nonminimal Supersymmetric Standard Model with Lepton Number Violation," *Physical Review D73*, 055012.

Devi, Th. G. and Kumar, K., 2005 "Anisotropy Shift and Raman Bandwidth Studies in Carbonyl containing molecule O-Chlorobenzaldehyde: Role of Repulsive forces" *Spectrochimica Acta Part A* 62:972-979.

Datta, Soma and Kumar, K., 2005 "Vibrational Dephasing and Hydrodynamic effects on Vibrational Relaxation Rates in Acetophenone: Raman Bandshape Analysis" *Spectrochimica Acta Part A* 62:473-477.

Huitui K., Laamanen, J., Pandita, P.N. and Roy, Sourov, 2005. "Phenomenology of non-universal gaugino masses in supersymmetric grand unified theories," *Physical Review D* 72, 055013.

Illa, X., Shukla, P. and Vives, E. 2006 "Zero-temperature Hysteresis in a Random-field Ising model on a Bethe Lattice: Approach to Mean-field Behavior with increasing coordination Number z " *Phys. Rev.B* 73,092414; Cond-mat/0511540.

Shukla, P. 2005 "Voter Dynamics on an Ising Ladder: Coarsening and Persistence" *J Phys. A: Math. Gen.* 38:5441-5451; Cond-mat/0501754.

Book Publications:

Tiwari, Y.N., 2005, *Essential Formulas, Integrals and Transforms for Physicists*, Lakshmi Pustakalaya, Patna.

Funds received from agencies other than NEHU :

Council of Scientific and Industrial Research, India:	Rs. 1,72,000.00
University Grants Commission, India:	Rs. 92,400.00
BRNS, DAE, Government of India:	Rs. 7,21,250.00
DST, Delhi	Rs.13,00,000.00

Research Project :

Ongoing

- (i) "Fermion Mass Matrices" (Principal Investigator: Prof. P.N. Pandita) sponsored by U.G.C., New Delhi
- (ii) "Models of Supersymmetry Breaking" (Principal Investigator: Prof. P.N. Pandita) sponsored by CSIR, New Delhi.
- (iii) Base-Line environmental studies in and around uranium mining area of Domiasiat" funded by DST-DAE (Principal Investigator: Prof. D.T. Khathing, co-investigator: Prof. P. Nongkynrih).

New

- (i) Investigations of Electrical Conductivity Doped Silver Halides (Principal Investigator: Prof. Y.S. Jain, Co-investigator, Drs. M.C. Mahato and S.S. Pohlong; Amount of Fund: Rs.21.0 lacs) sponsored by the DST, New Delhi.
- (ii) Design and Fabrication of a High Resolution: Three axes Laser Based Computerised Seismometer (co-investigator-Prof. D.T. Khathing) sponsored by DST, New Delhi.

(iii) Study of Particle Motion in Noisy Environment (Principal Investigator: Dr. M.C. Mahato; Amount of Fund: Rs.7,21,250/-) sponsored by BRNS, DAE, Government of India.

Academic/Professional Collaborations :

Prof. P. Shukla has collaborative research related to Statistical Mechanics of complex non-equilibrium with International Center for Theoretical Physics, Trieste, Italy, Department de Physique Theorique, CEA-Saclay, Paris, France, Department ECM, University of Barcelona, Barcelona, Spain and NORDITA, Copenhagen, Denmark.

Prof. P.N. Pandita has collaborative research on the subjects of Nonminimal Supersymmetry with Center for Atomic Energy, Saclay, France; Models of Supersymmetry Breaking with Helsinki Institute of Physics, Helsinki, Finland; Grand Unified Supersymmetric Models with Centre for High Energy Physics, Indian Institute of Science, Bangalore.

Prof. (Mrs) B.M. Jyrwa has collaborative research with Dr. S. Ganesan, BARC, Trombay, Mumbai and IGCAR, Kalpakkam related to Covariance Studies of neutron scattering from various radioisotopes.

Prof. P. Nongkynrih has collaborative research with Dr. V.D. Puranik, Head and other Scientists of EAD, BARC, Trombay related to Radiological Impact assessment at Uranium Mining sites in Meghalaya.

Honours/Awards/Recognition :

Prof. P. Shukla was elected Fellow of National Academy of Science (Allahabad).

Prof. P.N. Pandita was elected Fellow of Indian Academy of Science(Bangalore)

Prof. P.N. Pandita was offered Senior Associateship by the Institute of Mathematical Sciences, Chennai, January 2006-December 2008.

Other activities :

Prof. P. Shukla visited and delivered lectures at International Center for Theoretical Physics, Trieste, Italy, Department de Physique Theorique, CEA-Saclay, Paris, France, Department ECM, University of Barcelona, Spain and NORDITA, Copenhagen, Denmark.

Dr. M.C. Mahato visited the Abdus Salam ICTP, Trieste, Italy under the Regular Associateship scheme of ICTP during 16th Sept.-18th Nov, 2005 and delivered a seminar at ICTP on 19th Sept. on "V-I characteristics of a Modulated Josephson Junction: an analogous study."

Prof. P. Nongkynrih visited RPDD, BARC, Trombay during 15-21, May 2005 under visiting Scientist Scheme of BRNS, DAE, Government of India to participate in the neutron experiment related to shielding.

DEPARTMENT OF STATISTICS

Head : Dr. G. Das

Telephone: 272-2901 (O), 2550114 (R)

E-mail: gitasree@sancharnet.in

Thrust area of research : Survey Sampling, Bayesian Inference, Biostatistics, Computational Statistics, Demography, Econometrics, Distribution Theory.

Brief statement of academic activities :

- (i). Teaching 4 Semester M.Sc. Course in Statistics.
- (ii). Teaching Biometrics for M.Sc. Students of Zoology.
- (iii). Research guidance to Ph.D. students
- (iv). Research activity of the individual faculty members.

Faculty :

Readers : M.K. Das, M.Sc./Ph.D. (Dib.)
G. Das, M. A. (Delhi) Ph.D. (NEHU)
T.K. Chakrabarty M. Sc. (Agra), Ph.D (Mairipur)

Lecturers : B.K.Gupt, M. A. (Rohilkand), M. Sc.(AMU)
S.K.Jha, M.Sc./Ph.D (Patna)
R.Singh, M.Sc./Ph.D (Patna)

Visiting Professors/Fellows/Scholars in the Department : Professor Bimal K. Sinha, University of Maryland, Baltimore County, USA, visited the Department on 18.10.05 and delivered a lecture on "Some Aspects of Ranked Set Sampling with Applications".

Student Intake : Enrolment capacity: M.Sc. : 10

Actual admission :	SC/ST/Genl.	Male/Female	From Meghalaya/Outside
M.Sc. =	- 9 0	6 3	7 2

Degrees Awarded:

Actual admission :	SC/ST/Genl.	Male/Female	Total
Diploma =	- 6 0	2 4	6

Courses conducted :

PG Diploma: Semester II

Descriptive Statistics & Sampling Distribution; Statistical Methods; Sampling Techniques & Quality Control; Analysis of Variance & Experimental Design; Biometrics (for MSc. IVth Semester student of Zoology).

M. Sc.: Semester I

Ancillary Mathematics; Measure Theory and Probability; Distribution Theory; Matrix Algebra and Numerical Analysis (Pract); Distribution Theory (Pract); Computer Programming (Pract).

**Seminar/conferences/symposia/workshop/extension programmes etc. :
Attended**

Dr. G. Das attended VIII Biennial Conference of International Biometric Society (Indian Region), Oct. 6-7 2005, Bangalore and presented a paper.

Publications :

Published in India

Das, G., Ashesh, K. and Nandy, S. 2005. "Nonlinear Statistical Model for Culm Growth of Muli Bamboo-Melocanna baccifera". *International Journal of Ecology and Environmental Sciences*, 31 (4). 365-369

Infra structure facilitates : For M.Sc. Course, equipments viz. one Server, 20 computers, one dot matrix printer, UPS, anti virus software, necessary furniture etc. were purchased for the Computer Laboratory.

Research Projects :

Completed

Title: Application of Statistical Modelling on Management of bamboos

Principal Investigators' name: Dr. G. Das

Total Amount: Rs.3,68,400/-

Source: DST

The UGC Minor Research Projects

Title: Some contributions to Survey Sampling under Superpopulation Models.

Principal Investigators' name: Mr. B.K Gupta

Amount: 35,000/-

Source: NEHU unassigned grant under UGC minor research project.

Academic/Professional Collaboration : Collaboration with the Department of Ecology and Environmental Sciences, Assam University, Silchar on application of statistical modeling on management of bamboos.

Other activities : Dr. G. Das delivered two invited lectures on " Basic Concepts of Sample Survey" and "Preliminary Test Estimators in Survey Sampling" in the Department of Statistics, Dibrugarh University, on 7 January 2006.

CENTRE FOR SCIENCE EDUCATION

Head : Dr. Debashish Bhattacharjee

Telephone : 0364- 2227173 (O), 0364- 2223296 (R)

E-mail : debashis_ bhattacharjee @ yahoo. com

Thrust area of research : Theoretical Physics, Pure Mathematics (Number Theory), Science Education.

Brief statement of academic activities :

- i. Offered Remedial Teaching Programme in Mathematics, Physics, Chemistry and Biology to Tribal students of Class XI& XII.
- ii. Offered Remedial Coaching Programme in Physics, Chemistry, Mathematics, Botany and Zoology for 1st year B. Sc. (Hons) students belonging to SC/ ST category.

Faculty :

Professor : M. M. Singh, Ph. D. (Kuruk)
Readers : D. Bhattacharjee, M. Sc.(NEHU), Ph. D. (Warsaw)
P. K. Patra, M. Sc.(Sambalpur), Ph. D. (NEHU)
A. Chattopadhyay (on lien to Vishwa Bharati University)
M. Sc.(Calcutta), Ph. D. (NEHU)

Student Intake :

- i. No. of students in Remedial Teaching Programme for Class XI - 16
- ii. No. of students in Remedial Teaching Programme for Class XII - 28
- iii. No. of students in Remedial Coaching Programme for 1st year B. Sc. (Hons) - 4

Seminars/ Conference/ Symposia/ Extension programmes etc. :

Organised

Dr. A. Chattopadhyay, organized a Workshop on "Teaching of Biology for Secondary & Higher Secondary School/ College Teachers of Meghalaya" sponsored by National Academy of Sciences, India (Allahabad) from 7th to 12th November 2005.

Dr. D. Bhattacharjee, organized a Workshop on "Statistics Using MS-Excel" in collaboration with Applied Statistics Unit. ISI, Kolkata from 27th Feb. to 3rd March 2006.

Centre organized "World Environment Day" where students from different schools participated in essay competition, painting competition etc.