

SCHOOL OF PHYSICAL SCIENCES

The School of Physical Sciences was established in 1973 with Mathematics Department (starting from 1973), Physics Department (starting from 1976) and Chemistry Department (starting from 1976). Recently Centre for Applied Statistics has also been associated to this School.

The School aims at being a dynamic centre for post-graduate studies and research at the frontiers of physical sciences. The departments are devoted/committed for advanced research and teaching and have made notable strides in several frontier areas of Chemistry, Physics and Mathematics. Some of the faculty members have established strong interaction with premier research institutions in and abroad.

One of the significant yardstick of research activities of faculty members is the research grant they earn from different funding agencies. Many faculty members of this School have received significant sum as research grants from different funding agencies like - D.A.E., D.S.T., U.G.C., C.S.I.R., etc. Currently the total amount of on-going projects of several members of the School is running about Rs.80 lakhs.

CENTRE FOR APPLIED STATISTICS

The Centre for Applied Statistics was established in 1984. Main objective was to conduct teaching, research and training programmes in the field of Applied Statistics.

Head : Dr. M K Das.

Courses Conducted :

Certificate Course in Statistics, Mathematics & Descriptive Statistics, Computational Techniques & Elements of Probability Theory, Probability Distributions & Vital Statistics Methods, Economic Statistics & Indian Official Statistics, Descriptive Statistics & Sampling Distributions, Statistical Methods & Practical Problems on the topics covered in Statistical methods, Sampling Techniques & Statistical Quality Control, Analysis of Variance & Experimental Designs.

Student intake :

a) Enrolment capacity :	20				
b) Actual Admission :	SC/ST	Gen.	Male	Female	Total
	5	-	5	-	5

Faculty :

Reader :	M.K.Das, M.Sc., Ph.D (Dib.)
Lecturers :	G.Das, M.Sc(Delhi), Ph.D. (NEHU) B.K.Gupta, M.Sc (AMU)

Extension Lectures :

Mr. B.K.Gupta delivered a lecture on "Correlation and Regression in Life Science" in the U.G.C. Refresher Course in the Botany Department, NEHU, Shillong on 19.11.1998.

Research Programmes :

Mr. B.K. Gupta has registered for Ph.D. at Gauhati University.

Other Activities :

Dr. M.K.Das and Dr(Mrs) G.Das taught the Biometrics paper in 4th Semester M.Sc. Zoology.

DEPARTMENT OF CHEMISTRY

The Department was established in 1976. Since that time, the academic activities have centred around the teaching and research programmes. The Department has made significant progress and has contributed immensely towards carrying out research work in the frontier areas of Chemistry. As a result of the good research output of the Department, the UGC had sanctioned both the COSIST and the Special Assistance Programmes (SAP), which have helped to strengthen both the teaching and research programmes. The instrumentation and library facilities of the Department have been utilised not only by all the Members of the Department, but also by research groups from various institutions throughout the Country. The Department has a number of research projects in progress, and continues to maintain scientific collaborations with leading institutions in India and abroad. Several Faculty Members of the Department have received awards and honours. A total of 82 research students have received their Ph.D. Degrees from this Department, and have been gainfully

employed in various capacities.

Head : Professor Mahendra K. Mahanti

Faculty :

Professors : H.Junjappa, M.Sc.,Ph.D.(Karn.)
S.N.Bhat, M.Sc.(Karn.), Ph.D. (IIT Kanpur)
M.K.Chaudhuri, (on lien) M.Sc. (Kal.), Ph.D. (IIT Kharagpur)
M.P.Mahajan, (on lien) M.Sc.,Ph.D. (Punj.)
M.K.Mahanti, M.Sc.(Madr.), Ph.D. (Berh.)
K.Ismail, M.Sc., Ph.D. (AMU)

Readers : R.K.Poddar, M.Sc.,Ph.D. (IIT Kanpur)
K.K.Dwivedi, M.Sc. (L.now), Ph.D. (IIT Kanpur)
H.Chandra, M.Sc.(L.now), Ph.D. (Punj.)
B.Myrboh, M.Sc.,Ph.D. (NEHU)

Lecturers : S.Aravamudhan, M.Sc. (S.V.Univ.), Ph.D.(IIT Kanpur)
A.Lemtur, M.Sc.,Ph.D. (NEHU)
R.H.Duncan Lyngdoh, M.Sc. (NEHU), Ph.D.(IIT Kanpur)
K.Mohan Rao, M.Sc.(S.V.Univ.), Ph.D. (IIT Kanpur)

Student Intake :

Enrolment capacity : M.Sc. : 30
Ph.D. : 06

Actual admission : SC/ST/Genl. Male/Female Total
M.Sc. : 24 06 24 06 30

Degrees Awarded :

Ph.D.

Suchandra Bhattacharjee, "Single Electron Transfer Reaction Studies by Optical and ESR Spectroscopy". Supervisor : Dr. H.Chandra.

Md.Nadeem Khan, "Single Electron Transfer Reaction Studies by ESR". Supervisor : Dr. H.Chandra.

A.Deb Roy, "Kinetics of Oxidation of Some Diols and Hydroxy Acids by Quinolinium Dichromate". Supervisor : M.K. Mahanti.

Sunita Dastupta, "Kinetics and Mechanism of Reduction of Some Metal Ions by Sodium Tetrahydroborate". Supervisor : Professor M.K. Mahanti.

Sontosh Dev, "Physicochemical Studies of Room Temperature Molten Salt Systems

Containing Hydrated Inorganic Salts and Organic Compounds". Supervisor : Professor K. Ismail.

Dipak Sinha, "Radiation Induced Modification on Some Dielectric Solids". Supervisor: Dr. K.K. Dwivedi.

J.R.Suresh, "Synthetic Studies on Heterocycles". Supervisor : Professor H. Junjappa.

Funds received from agencies other than NEHU/UGC.

Department of Science & Technology : Rs. 8.00 lakhs.

Courses Conducted :

Compulsory

Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Quantum Chemistry, Laboratory Course in Inorganic Chemistry, Chemical Binding and Molecular Spectroscopy, Laboratory Course in Organic Chemistry, Applications of Spectroscopic Methods, Laboratory Course in Physical Chemistry, Environmental Chemistry, Analytical Chemistry and Computers.

Optional

Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Project Work (Inorganic/Organic/Physical Chemistry).

Seminars/Conferences :

Attended:

K.Ismail, (a) delivered Lectures (2 February 1999) in the Department of Chemistry, Mangalore University, Mangalore "On Effect of Acetate and Propionate Co-ions on the Micellization of Sodium Dodecyl Sulfate in Water", (b) attended a Conference on Thermophysical Properties of Solids and Fluids in the Department of Physics, Gauhati University, Guwahati (11-13 March 1999) and presented a Paper titled "Micellization of Surfactants in Acetamide Mlet".

M.K.Mahanti, (a) attended a National Symposium on "Frontier Areas in Chemical Dynamics" held at Rani Durgavati University, Jabalpur (5-7 February 1999) and delivered a Plenary Lecture titled "Novel features of quinolinium dichromate oxidations", (b) delivered an Invited Lecture at Utkal University, Bhubaneswar (16 February 1999) titled "Quinolinium dichromate oxidations", (c) attended a National Symposium on "Chemistry in the Next Century" held at Jai Narain Vyas University, Jodhpur (15-17 March 1999) and delivered a Plenary Lecture titled "Perspectives in Femtochemistry".

Visiting Professors :

Professor H.Suryaprakash Rao, Department of Chemistry, Pondicherry University, Pondicherry (Visiting Fellow, May and June 1998) delivered Lectures in the M.Sc. IV Semester Organic Chemistry Course.

Professor H.Suryaprakash Rao, gave a Seminar Talk titled "Synthetic Adventures with Chalcone" (19 June 1998).

Professor K.K.Banerji, Department of Chemistry, Jai Narain Vyas University, Jodhpur, gave a Seminar Talk titled "Correlation Analysis of Reactivity in some Nucleophilic Additions to Activated Alkenes" (19 August 1998).

Guest Lecturers :

1. Dr. Pradip C. Paul, Department of Chemistry, St.Anthony's College, Shillong (August-November 1998) delivered Lectures in the M.Sc. I Semester Inorganic Chemistry Course.

2. Dr. Irona Nongkynrih, Department of Chemistry, St.Mary's College, Shillong (August-October 1998) delivered Lectures in the M.Sc. III Semester Organic Chemistry Course.

3. Dr. T.S. Basu Baul, RSIC, Shillong, (October-November 1998) delivered Lectures in the M.Sc. III Semester Inorganic Chemistry course.

Publications :

Suchiang,E., Debroy,A. and Mahanti,M.K. (1998). Kinetics of oxidation of benzylamines by quinolinium dichromate, *Oxidation Communications*, 21, 376-380.

Kharmutee,R., Debroy,A. and Mahanti,M.K. (1998). Dual behaviour of quinolinium dichromate in the oxidation of hydroxyacids, *Oxidation Communications*, 21, 553-558.

Karim,E. and Mahanti,M.K. (1998). Kinetics of oxidation of serine and threonine by quinolinium dichromate, *Oxidation Communications*, 21, 559-564.

Paul,B.C., Islam,S.S. and Ismail,K. (1998). Effect of acetate and propionate co-ions on the micellization of sodium dodecyl sulfate in water, *J. Phys. Chem-B*, 102, 7887-7891.

Bhattacharjee,B. and Bhat, S.N. (1999). Viscosities of binary and ternary liquid mixtures of alkylbenzenes with carbon tetrachloride in cyclohexane, *J. Ind. Chem. Soc.*, 76, 90-94.

Chaubey,G.S. and Bhat,S.N. (1999). Role of surfactants on the mutual solubility of phenol-water system, *J. Ind. Chem. Soc.*, 76, 138-141.

Bhattacharjee, B. and Bhat,S.N. (1999). Studies on molecular interaction of tetracyclines with adenine : A spectroscopic investigation, *J. Ind. Chem. Soc.*, 76, 243-247.

Dwivedi,K.K., Kulshreshtha,A. and Raju, J. (1998). Computer oriented numerical analy-

sis of nuclear track data, *Int. J. Radiat. Appl. Instrum (Part D) : Radiat. Meas*, 29, 165-171.

Sinha, D. and Dwivedi, K.K. (1998). Modification of radiation detection response of PADC track detectors, *Int. J. Radiat. Appl. Instrum. (Part C) : Radiat. Phys. Chem.*, 53, 99-105.

Dwivedi, K.K., Srivastava, A., Ghosh, S., Sinha, D., Singh, S., and Avasthi, D.K. (1998). Energy-loss of ^{12}C ions in different polymeric materials, *Ind. J. Pure and Appl. Phys.*, 36, 361-365.

Sen, M., Mishra, R., Tripathy, S.P., Sinha, D., Kulshreshtha, A., Dwivedi, K.K., Deka, P. and Bhattacharjee, B. (1998). Assessment of Indoor Radon in Shillong. *Assam Sci. Soc. Journal*, 39, 104-113.

Study Tour/Field Trips :

The Department organised a study tour for the M.Sc. students during January 1999 led by Dr. R.H.D. Lyngdoh, Lecturer in the Department. 19 students participated. The team visited Bhabha Atomic Research Centre (BARC), Trombay, Tata Institute of Fundamental Research (TIFR) and several Chemical Industries in Mumbai, and the Chemical Laboratories of I.I.Sc., Bangalore.

Thrust Areas of Research :

Research activities in Organic Chemistry have focused attention developing newer synthetic methods for important heterocyclic and carbocyclic compounds of biological relevance. A number of such compounds are being screened for assessment of their activity. Synthetic and mechanistic studies on cycloaddition reactions of novel azadienes and oxyplumbation reactions are carried out. In Theoretical Organic and Bio-organic Chemistry, the research involves investigating the molecular basis of carcinogenesis, mutagenesis, and of the genetic code. Some activities on designing of DNA-like polymers and on time saving techniques in Computation Chemistry are also being pursued.

Research activities in Physical Chemistry include work on the properties of organic semiconductors, nuclear interactions involving charge-transfer complexes, hydrogen bonding and hydrophobic interactions, and on micelles. Research in Chemical Dynamics pertains to electron-transfer processes, the use of newer reagents for oxidation, and in the design of ions by sodium tetrahydroborate. Work on the transport behaviour of electrolytes in aqueous and molten media as a function of temperature and pressure are actively pursued. Theoretical studies on vibrationally excited states are in progress. ESR studies on single electron transfer reactions and free radicals using the spin trapping technique are being carried out. EPR studies on the oxidation products of metalloporphyrins and related bio-inorganic systems are also being conducted. Studies on the redox potential of porphyrins and metalloporphyrins using cyclic voltametry are also being pursued. Research in the area of determination and applications of contributions to shielding tensors is being conducted.

Research activities in Inorganic Chemistry address to the synthesis, characterisation and evaluation of molecular structures by different techniques. Studies on the reactivity of fluoro, peroxy/dioxygen and (-diketonatometallates, and fluoro and peroxy compounds of non metals, sulfoxide and arylazo complexes of transition metals are being carried out. Emphasis is also being given to studying the stabilization of unusual oxidation states of metals, and in the development of newer reagents and catalysts. Research work has been initiated pertaining to the synthesis and characterisation of organometallic compounds involving cyclopentadienyls, heterocycles, and aromatic half sandwich platinum group metal compounds. Research activities related to Nuclear and Environmental Chemistry include heavy ion range and energy loss in solids, and in the development of nuclear track microfilters. Studies are being done on fusion-fission and particle evaporation, radon monitoring and the measurement of trace pollutants in the environment.

Research Programmes/Projects :

The Department has several ongoing Research Projects, sponsored by different funding agencies. New Research Projects initiated during the period under report, are :

Dr. K.Mohan Rao, "Synthetic and Structural Studies on (cyclopentadienyl and Azacyclopentadienyl) Ruthenium (II) Bisphosphine complexes", by the Department of Science and Technology, New Delhi.

Other Activities :

Professor S.N.Bhat continued to be a Member of the UGC Chemistry Panel, and the Chancellor's Nominee to the West Bengal College Service Commission.

Dr. K.K.Dwivedi was appointed as the Vice-Chancellor of Arunachal University in January 1999.

Dr. B.Myrboh organised a Regional Workshop on "Peoples Participation in Biodiversity Conservation" under the auspices of the North Eastern Biodiversity Research Cell, NEHU, Shillong (4-6 March 1999).

DEPARTMENT OF MATHEMATICS

The Department was established in 1974. The Department gives quality and rigorous M.Sc./M.Phil and Pre Ph.D. courses of the fundamentals of the core subjects of mathematics like algebra, analysis, differential equations, topology/geometry, number theory and their applications. It gives two computer courses in M.Sc. and also pursues research in computer aided approach to mathematical research (number theory, cosmology, algebraic and differential topology, oceanography etc.).

The great dearth of good mathematics teachers in the N.E. region at all levels of mathematics education by successful students and scholars of the Department.

The Department has successfully guided seven Ph.D. and eleven M.Phil students.

The Department has successfully completed research projects funded by Department of Atomic Energy, India and University Grant Commission.

Head : Professor H. K. Mukherjee.

Faculty :

Professors : S.S. Khare, M.Sc., Ph.D. (Allhd.)
M.B. Rege, M.Sc., Ph.D. (Bom. Univ)
S.K. Srivastava, M.Sc., Ph.D. (Gorak)
H.K. Mukherjee, M.Sc., Ph.D. (Allhd.)
Readers : P.K. Saikia, M.Sc. (Delhi), Ph.D. (Wis.)
Lecturers : (Ms.) C.R. Mondal, M.Sc., Ph.D. (V.B)
A.K. Das, M.Sc., Ph.D. (NEHU)
R.P. Shukla, M.Sc., Ph.D. (Allid.)

Student Intake :

(a) Enrolment capacity : 30
(b) Actual Admission : M.A./M.Sc. SC/ST Gen Male Female Total
15 9 17 7 24

Courses Conducted :

Linear algebra, Analysis I, Ordinary Diff. Equation, Mechanics, Analysis II, Topology, Partial Diff. Equation, Algebra I, Complex Function Theory, Computer Programming, Topics in Algebra, T.A.N.T-I., Functional Analysis, Elementary Number Theory, Computer Numerical Analysis, Ring Theory.

Seminars/Conferences :

Dr. A.K. Das attended "The Winter School on Transformation Groups" at Indian Statistical Institute Calcutta from 8th Dec. 1998 to 24th Dec. 1998 and delivered two lectures on the Theory of Bordism.

Professor S.K. Srivastava (I) attended the International Conference on Mathematical Physics, held at Nagpur University and delivered an invited talk on "Dual nature of the Ricci scalar and cosmological models" in Jan. 1999. (ii) Attended IAGRG meeting held at Gorakhpur University, Gorakhpur and gave an invited talk on "Kaluza-Klein Theory" in Jan. 1999.

Professor H.K. Mukherjee (I) attended Group monitoring workshop at Bombay University on Oct. 26, 1998 and presented report on the project "Computer aided approach to some classification problem in different topology". (ii) Attended Workshop on symplectic

topology at IIT , Bombay, Nov. 30-Dec 6 1998 and delivered an invited talk on "Classification of manifolds-a brief survey;". (iii) Attended Winter School on Transformation group at ISI, Calcutta Dec 8-26 1998 and delivered three lectures on Bredon's, Floyd-Richardson's, and Conner-Floyd's examples of non orthogonal actions. (iv) Attended Refreshers Course in Gauhati University and delivered two talks on Algebraic Topology in April 1998.

Professor S.S. Khare (I) attended Winter School on Transformation group at ISI, Calcutta Dec 8-26 1998 and delivered 3 talks on Equivariant Vector bundles, Slice and Tube Theorem. (ii) Attended Refreshers Course in Gauhati University and delivered two talks on Algebraic Topology in April 1998.

Visiting Professor/Fellows :

- (i) Professor Ramji Lal, Allahabad University , Allahabad.
- (ii) Professor Avinoamann, Hevriew University, Jerusalem.
- (iii) Professor Malay Dutta, Tezpur University.
- (iv) Professor P.K. Jain, Delhi University.

Publications :

Das,A.K. (1999) : Bordism of Stable vector bundle with small cobcat. J. of Ind. Math. Skoc. Vol. 66

Srivastava,S.K. (1998) : "Dual nature of Ricci scalar and inhomogeneous cosmological models" *IL Nuovo Cimento* Vol.113B , No.10, pp. 1229-1251.

Srivastava,S.K. (1999) : "The riccion, instanton and primordial inflation" *Into J. Mod. Phys. A*. Vol 14, No.6, 875-884.

Books: Srivastava,S.K. (1998) "*Aspects of gravitational interaction*" Co-authored with Professor K.P. Sinha, Nova. Science Publishers, New York.

Study Tour/ Field Trips :

Went on a study tour to the Mawsynrem Hot spring in connection with the application of Mathematics in environmental Studies.

Thurst Area of Research :

Pure and Applied Mathematics.

Other Activities :

Professor H.K. Mukherjee has reviewed an article entitled 'Equivariant Hopf theorem' by Zalman Balanov, *Nonlinear Analysis* 30 (6)(1997), 3463-3474, for the *Mathematical Re-*

views of the American Mathematical Society.

Dr.R.P.Shukla visited Mehta Research Institute, Allahabad from January, 22nd to Feb. 15th (1999).

The pursuit of quality research by the faculty members of the department has got recognition from National and International Mathematics and physics communities. Faculty members of this Department were invited to deliver talks at National and International Conferences and Seminars at: Allahabad University; ISI, Culcutta and Bangalore; IIT Bombay; Iisc Banagalore; IIT Delhi. They have also participated and delivered talks at the International Congress, (ICM), Berkeley, USA; Duke University at Durham, USA; University of Edinburgh, UK. They have been conferred with the following :

Faculty members have received both National and International recognition. These include, Meghnad Saha Award, Honourable mention by US Gravity Research Foundation to Professor S K Srivastava, the fellowship of National Academy of Sciences Professor S S Khare and Professor S K Srivastava, the Fulbright fellowship and Commonwealth academic exchange fellowship to Professor SS Khare, the Indo-French Cultural exchange fellowship, International Mathematical Union grant to participate in ICM-86 to Professor H K Mukherjee, and a research fellowship of the University of Wisconsin at Madison, USA, to Dr.P.K. Saikia.

The department has been organising and co-ordinating training programme and examinations of regional and National Mathematical Olympiad for last ten years. It has brought about awakening about problem-solving in mathematics at school level which will go a long way to produce good mathematicians.

DEPARTMENT OF PHYSICS

The department of Physics was established in 1976 with a view to build scientific manpower in this part of the country consistent with the NEHU Act.

In the course of several years the Department could attract a wide spectrum of talented faculty and has identified Nuclear Physics (Experimental and Theoretical), Laser Physics (Experimental), Solid State Physics (Experimental and Theoretical) and High Energy/Particle Physics (Theoretical) as the thrust areas in its teaching and research programmes. These areas are included in the list of thrust areas by the Department of Science and Technology, Government of India. The Department conducts teaching and research programmes leading to MSc, M.Phil. and Ph.D. degrees. The Department plays, through the Board of Under Graduate Studies in Physics, a pivotal role in framing the physics syllabus for B.Sc.(Gen) and B.Sc. (Physics Major) programmes of affiliated colleges. Similarly, the Board of Post-graduate Studies in Physics monitors the M.Sc., M.Phil, and Ph.D. programmes including the framing of syllabi. The M.Sc. syllabus which was operating since 1985 was revised in 1996, within the general framework of UGC guidelines.

Head : Professor C S Shastry

Faculty:

Professors : A.L. Verma, M.Sc.(Lucknow), Ph.D.(IIT Kanpur)

C.S. Shastry, M.Sc.(Karn), D.Phil.(Calc)

Y.S.T. Rao, M.Sc.(And.), Ph.D.(Maryland)

P. Shukla, M.Sc.(IIT, Delhi), Ph.D.(Temple Univ. U.S.A)

R. Singh, M.Sc.(Alig.), Ph.D.(IIT Kanpur) (on lien)

K. Kumar, M.Sc.(Agra), Ph.D.(IIT Kanpur)

Readers : Y.S. Jain, M.Sc.(Agra), Ph.D.(IIT Kanpur)

*D.T. Khathing, M.Sc.(Delhi), D.Phil.(Calc)

P.N. Pandita, M.Sc. Ph.D.(Kashmir)

P.N. Ram, M.Sc.D.Phil.(Alld.) (on lien)

M.K. Parida, M.Sc. Ph.D.(Utkal) (on sabbatical leave)

Mrs. B.M. Jyrwa, M.Sc., Ph.D.(NEHU)

Ms. P. Nongkynrih, M.Sc, Ph.D. (NEHU)

Lecturer : P.K. Bajpai, M.Sc. Ph.D.(NEHU) (on lien)

*On deputation from the Department, working as Head, Regional Sophisticated Instrumentation Centre (RSIC), NEHU, Shillong

Students Intake:

(a) Enrolment capacity : M.Sc. 26

(b) Actual Admission :	SC/ST		General		Total
	Male	Female	Male	Female	
	10	1	9	0	20

Degrees Awarded:

Ph.D.

Severine S. Pohlong "Dynamical Properties of Point Defects in Metals. Supervisor: Dr. P.N. Ram

Courses Conducted:

Classical Mechanics; Quantum Mechanics I; Mathematical Physics; Laboratory I; Electrodynamics; Electronics; Quantum Mechanics II; Laboratory II; Atomic & Molecular Physics; Solid State Physics; Nuclear Physics; Laboratory I,II,III; Thermal Physics; Experimental Techniques; Many Body Theory and Optional special papers on Laser Physics; Solid State Physics; Nuclear Physics; High Energy Physics; Environment.

Seminars/Conferences

Attended :

Professor A.L. Verma (I) delivered an invited Talk on "Dynamics of Energy Transfer

Near Reflecting Surfaces" in the National Laser Symposium held at Indian Institute of Technology, Kanpur from December 14-16, 1998. (ii) Delivered a talk on "Orientational Dynamics and Quantum Mechanical Tunneling of Molecular Ions in Solids" in the Sixth Asian Conference on Solid State Ionics held at Surajkund from November 29 to December 4, 1998.

Professor C.S. Shastry (I) contributed a paper (read by co-author B. Sahu) in International Workshop on Rare Nuclear Processes in Low Energy heavy ion physics, held at Nuclear Science Centre, New Delhi, in Nov 1998. Title: Asymmetric Barrier Model for heavy ion fusion and its relation to channel coupling. (ii) contributed a paper (read by co-author B. Sahu) at DAE Symposium on Nuclear Physics, Dec (1998) held at BARC, Bombay. Paper: Asymmetric Parabolic Barrier Model for heavy ion fusion. Ref. DAE symposium on Nuclear Physics 41B (1998) p140. (iii) gave a seminar on Barrier Region Resonances at Institute, Bhubaneswar in Feb 99. (iv) read a paper on Accomplishment of Dept. of Physics, NEHU in the National Conference on 50 years of Science and Technology in the North East, held at Shillong College, May (1998) (v) chaired a session in the All India Amateur Astronomer's meet at Shillong in April-May 1998.

Professor Kamal Kumar contributed a paper in the National Laser Symposium Dec 14-16, 1998 held at IIT Kanpur Arpita Das and Kamal Kumar. "Raman linewidth of the C=O stretching Mode: Solvent dependent studies in Benzaldehyde." pp 96-97. Proceeding of National Laser Symposium Dec. 14-16, 1998.

Dr. D.T. Khathing contributed the following papers read by authors : (I) Dwivedi, K.K., Ghosh, S., Fink, D., Mishra, R., Tripathy, S., Kulshreshtha, A., Khathing, DT (1998). "Modifications in Tract Registration Response of PADC detector by energetic protons", presented in the 19th International Conference on Nuclear Tracks in Solids, August 1-4, Besancon, France. (ii) Tripathy, S P, Mishra, R., Kulshreshtha, A., Dwivedi, K.K., Khathing, D T, Srivastava, Avasthi, D.K., Ghosh, S. and Fink, D. (1998). "Proton induced modification on track registration in PADC", presented in the International conference on Swift Heavy Ions in Materials Engineering and Characterisation, September 20-22, NSC, Delhi. (iii) Tripathy, SP, Mishra, R., Dwivedi, K.K., Khathing, DT (1998), "On the Isothermal and Isochronal Annealing of Znp glass tract detector", presented in the 19th International Conference on Nuclear Tracks in Solids, August 1-4, Besancon, France. (iv) Tripathy, S.P, Mishra, R., Mawar, A.K., Khathing, D T, Dwivedi, K.K., Srivastava, A., Avasthi, D.K. Ghosh, S. and Fink, D. (1998)". Investigation on carbon cluster formation in heavy ion irradiated polymers", presented in 11th National Symposium on SSNTDS, September 12-14, GNDU, Amritsar. (v) Shyam, S., Mishra, R., Tripathy, SP, Mawar, A.K., Dwivedi, K.K., Khathing, DT, Srivastava, A. and Avasthi, D.K. (1998). "Mean range and Energy loss of 28Si ions in some Makrofol track detectors", presented in 11th National Symposium on SSNTDS, September 12-14, GNDU, Amritsar. (vi) Mishra, R., Tripathy, SP, Kulshreshtha, A., Khathing, DT, Dwivedi, K.K., Ghosh, S. and Fink, D. (1998). "Effects of different doses of 2 MeV electron on PADC", presented in the International Conference on Swift Heavy Ion in Materials Engineering and Characterisation, September 20-22, NSC, Delhi. (vii) Tripathy, SP, Mishra, R., Kulshreshtha, A., Srivastava, A., Khathing, DT, Dwivedi, K.K. and Avasthi, D.K. (1998). "Range and Energy loss rate of 118MeV 28Si in some polymers", presented in Nuclear and Radiochemistry Symposium, January 19-

22, BARC, Mumbai (Oral Presentation - Awarded). (viii) Mishra, R., Tripathy, SP, Sinha, D., Khathing, DT, Dwivedi, K.K., Ghosh, S., Muller, M. and Fink, D. (1999). "Polymer Modification via Cluster Formation", presented in Nuclear and Radiochemistry Symposium, January 19-22, BARC, Mumbai (Oral Presentation- Awarded). (ix) Lotha, S., Khathing, DT, Ingale, A., Avasthi, D.K., Mittal, V.K., Mishra, S., Rustagi, RC, Gupta, A., and Kulkarni, V.N. (1998). "Electronic Excitation Induced Transformation of C60", "SHIMEC" International Conference, October 19-22, NEC, New Delhi.

Mr. V.K.Lotha, teacher fellow under Dr. DT Khathing presented the following papers (i)Mittal, V.K., Lotha, S.* and Avasthi, D.K. (1998). "Ion track radium estimation by on-line hydrogen release measurement", Swift heavy ion in polymers and Insulating materials, Workshop, March, GNDU, Amritsar. (ii) Biswas, A., Lotha, S.*, Singh, JP, Avasthi, D.K., Awasthi, A.M., Bhardwaj, S. and Bose, SK (1998). "The Effects of Swift Heavy ion irradiation on the melting characteristics and crystallinity of PET", "SHIMEC" International Conference, October 19-22, NEC, New Delhi. (iii) Mittal, V.K., Lotha, S.*, and Avasthi, D.K. (1999). "Hydrogen loss under Heavy ion irradiation in Polymers". Rad. Eff. Def in Solid 147 (1999) 199
*Teacher Fellow under Dr. D T Khathing.

Dr. B.M. Jyrwa attended and presented a paper (I) with B.Lyngdoh (1998), "Application of Glauber Model to Low Energy Light Particles", at the Regional Conference on Physics Research in the North East, held at IIT Gauhati on 17th October. (ii) with B.Lyngdoh (1998), "Applications of Glauber Model to Low Energy Light Ions", at the Nuclear Physics DAE Symposium December, BARC Mumbai. (iii) with B.Lyngdoh (1998), "Determination of Correlation Matrix for a Simple System", at the Nuclear Physics DAE Symposium December, BARC Mumbai. Dr. P.Nongkynrih presented (1998) "Trace Elements Analysis in Rice Soils and Plants in Meghalaya", at the Regional conference in Physics Research in the North East, held at IIT Gauhati on 17th October.

Visiting Professors:

1. Professor L. Satpathy of Institute of Physics, Bhubaneswar visited the Department during May, 1998 and gave a seminar on "Mass Formula Formula for Atomi Nucleus."
2. Professor Ms. Chatterjee from IIT Delhi visited the Department on 23.6.98 and interacted with several faculty members.
3. Professor Deepak Dhar of TIFR Mumbai visited the Department during September-October '98 and gave a seminar entitled "Biased Diffusion in Disordered Media Theory: Confront Simulation."
4. Dr. SK Gupta, Senior Scientist, BARC visited the Department during October 1998 for collaborative research and gave a seminar on "New State of Matter Quark Gluon Plasma"
5. Dr. Biswarup Mukhopadhyaya of Mehta Institute, Allahabad visited in March 1999 and gave a seminar on "Neutrino masses and supersymmetry - some

phenomenological implications.”

Publications:

Ananthanarayan, B. et al. (1998). Beyond the Standard Model: Working Group Report. *Pramana* 51, 305 - 311.

Bhruguvansh, P., Singh, R.K., Asthana, BP, Singh, P.R., Chakraborty, T. and Verma, A.L.; (1998) “Estimation of Lorentzian Linewidth, Fractional Lorentzian Character, and Spectral Slit Width Using Different Raman Line Shape Parameters”; *Asian Journal of Physics*, 7, 323-327.

Dash, S.K., Singh, R.K., Alapati, P.R. and Verma, A.L.; (1998) “A Comparative Laser Raman Study on TB4A, TB7A, and TB10A Liquid Crystals”; *Liquid Crystals* 25, 459-465.

Dash, SK, Singh, R.K., Alapati, P.R. and Verma, A.L.; (1998) “Laser Raman Study of Terephthaldehyde-bis-p-n-Decyl-Aniline 9TBDA”; *Mol. Cryst. Liq. Cryst.* 319, 147-158.

Das, Arpita and Kumar Kamal; (1998) “Micro-environment dependence of vibrational relaxation in P-methyl acetophenon”; *Spectrochim Acta* 54A, 793 798.

Dress, M., Ma, E., Pandita, P.N., Roy, DP and Vempati, S. (1998); “Light Higgs Bosons in Supersymmetric Models”; *Physics Letters* B433, 346 -354.

Huitu, K., Pandita, P.N. and Poulamaki, Kai (1998); “The Mass of Lightest Higgs Boson in Supersymmetric Left-Right Models”; *Physics Letters* B423, 97 - 103

Jamir, I., Lyngdoh, E.F.P. and Shastri, CS; (1998) “Correlation between zeroes and poles of S matrix for complex potentials”; *Pramana* 50(1998)271

Lyngdoh, E.F.P., Jamir, I. and Shastri, CS, “Shrodinger equation with complex potentials: the phenomenon of absorption”; *Physics Education* July-Sept(1998)147

Nongkynrih, P.; (1998) “Biological Clock: Its Medical Utility”, *News Letter, ISAS* Shillong Chapter, September.

Osland, P. and Pandita, P.N. (1999); “Measuring the Trilinear Couplings of MSSM Higgs Bosons in Electron - Positron Colliders”; *Physical Review* D59, 0550131-05501318

Pachau, Z., Gurung, S., Thapa, R.K., Khathing, DT and Kar, N. (1999). “Photo-current calculations in semiconductors using Kronig-Penney model”. *Indian J. Phys.* 73A (2) 237-243.

Pandita, P.N. (1998); “Particle Mass Limits in Minimal and Nonminimal Super-symmetric Models”; *Pramana* 51, 169 - 180.

Sahu, Basudeb, Jamir, I., Lyngdoh, E.F.P. and Shastry, CS; (1998) "Fusion under a complex barrier; *Phys. Rev. C* 57, 1853

Shantha, P.K., Thanga, H.H. and Verma, A.L.; (1998) "Photoreduction of Fe(TPP)Cl in CH₂Cl₂ and DMSO in the Presence of, and in Neat 1,Dimethylimidazole Without Alcohol: Evidence of a Photoreactive State from Resonance Raman and Optical Absorption Studies; *J. Raman Spectrosc.* 29,997-1001.

Shukla, P. (1998); "Metastability and Hysteresis in Random Field Ising Chains"; *Indian Journal of Physics*, 72A(5), 439-446. (invited article)

Singh, R.K., Asthana, BP, Verma, A.L. and Pathak, C.M.;(1998) "Raman Study of Concentration dependence of the Frequency Shifts and Linewidth Changes in (3-Cl-Pyridine + Methanol) System; *Chem. Phys. Lett.* 278, 35-40.

Singh, R.K., Asthana, BP, Singh, P.R., Chakraborty, T. and Verma, A.L.;(1998) "Raman Study of the Vibrational Relaxation of the (C N) Stretching Mode of Acetonitrile in Binary Liquid Mixtures with Hydrogen Donor Solvents; *J. Raman Spectrosc.* 29,561-566.

Verma, A.L.; "Orientational Dynamics and Quantum Mechanical Tunneling of Molecular Ions in Solids; *Solid State Ionics: Science & Technology* Ed. by V.R. Chowdari et al., World Scientific Publishing Co., pp 525-536.

Verma, A.L., Zhang, Z., Tamai, N. and Ozaki, Y.; (1998) "Dynamics of Intra-, and Inter-layer Energy Transfer in Langmuir-Blodgett Films of 5-(4-N-Octadecyl-pyridyl)-10, 15, 20-Tri-p-Tolyl-Porphyrin Studied by Time-Resolved Fluorescence Spectroscopy; *Langmuir* 14, 4638 - 4642 .

Zhang, Z., Verma, A.L., Tamai, N. and Ozaki, Y.; (1998) "Excitation Energy Transfer in Langmuir-Blodgett Films of 5-(4-N-Octadecyl-pyridyl)-10, 15, 20-Tri-p-Tolyl-Porphyrin Studied by Time-Resolved Fluorescence Spectroscopy; *Thin Solid Films* 333, 1-4

Zhang, Z., Verma, A.L., Nakashima, K. and Ozaki, Y., (1998) "Thermal Behaviour of Langmuir-Blodgett Films of 5-(4-N-Octadecyl-pyridyl)-10, 15, 20-Tri-p-Tolyl-Porphyrin Studied by Ultra-violet-Visible and Infrared Spectroscopies; *Thin Solid Films* 333, 1-4.

Study Tour/Field Trip :

A study tour for M.Sc. students was organised under the guidance of Professor P.Shukla. Sixteen students visited Mumbai, Goa, Bangalore, Mysore and Chennai during the period Jan 17, 1999 to Feb 10, 1999. The students were also accompanied by Sri Lakshman Joshi, Technical Assistant, Physics Department, NEHU.

Thrust Area of Research:

Nuclear Physics, Laser Physics, Solid State Physics, High Energy Physics.

Research Programmes / Research Projects:

On-going sponsored research programmes include (i) DST (Rs.40.2 Lakhs) on resonance roman under Professor A.L.Verma, (ii) DST (Rs. 4.66 Lakhs) on optical model under Dr. B.M.Jyrwa, (iii) DAE (Rs. 4.63 Lakhs and Rs. 7.02 Lakhs) on Biological Clocks and micronutrients under Dr. P.Nongkynrih, (iv) DST & DAE projects under Dr. P.N. Pandita successfully completed projects under Dr. P.N. Pandita during the year under review include:

- (i) Supersymmetry with Extended Gauge Groups (Department of Science and Technology)
- (ii) Supersymmetric Grand Unification (Department of Atomic Energy)

A major research project entitled "Search for Higgs Boson at present and future colliders" was also sanctioned by the University Grants Commission to be carried out under the supervision of Dr. P.N. Pandita.

Dr. P.N. Pandita carried out collaborative research work with:

- (i) Professor Per Osland, University of Bergen, Norway on physics of Higgs bosons.
- (ii) Dr. K. Huitu and K. Poulamaki, Helsinki Institute of Physics, Finland on Supersymmetric Left-Right models.
- (iii) Dr. B. Ananthanarayan, Indian Institute of Science, Bangalore, on Beyond the Standard Model.

Other Activities:

Professor A.L. Verma (I) acted as a member of the National Organising Committee for the National Laser Symposium held at Indian Institute of Technology, Kanpur from December 14-16, 1998. (ii) Professor Verma is having additional responsibility at Head of USIC, NEHU w.e.f. 25-8-1998.

Professor C.S. Shastri (I) visited Physics Department, Mangalore University in Jan 99 and gave a set of 10 lectures on Nuclear Structure to M.Sc. students/scholars. (ii) visited Institute of Physics, Bhubaneshwar in Jan-Feb 1999 for 3 weeks for collaborative research work. (iii) was a member of Advisory Committee of DAE Symposium on Nuclear Physics(1998) organised by DAE.

Professor P. Shukla was selected as a Senior Category Speaker under the Theoretical Physics Seminar Circuit Programme (TPSC) for the year 1998-2000. He was also appointed an Associate of the Institute of Mathematical Sciences, Chennai. Professor Shukla visited Institute of Physics, Bhubaneshwar (Dec 98); IIMSC, Chennai(Jan 99); and Banaras Hindu University (March 99) under the TPSC programme and gave talks on his current

research work. He also visited IIT, Madras and IGCAR, Kalpakkam in Jan 1999 and gave talks there.

Dr. P.N. Pandita (I) was invited by Deutsches Elektronen-Synchrotron (DESY), Germany to visit its Theory Group for two months from January to February 1999. (ii) was appointed as a Senior Associate of the Inter University Centre for Astronomy and Astrophysics, Pune, India, for three years (1998-2001). (iii) was elected as a National Organising Committee Member for the "Workshop on High Energy Physics Phenomenology-VI" to be held at the Institute of Mathematical Sciences, Chennai during January 2000.