SCHOOL OF PHYSICAL SCIENCES
Department of Physics

The department of Physics provides post-graduate education and offers research facilities in areas of physics relevant to the national and regional needs. It intends to train the students so that they may be able to tackle and solve various problems using their scientific skill. It thus hopes to build the scientific man-power required particularly in the north-eastern region of the country.

This was the fifth year of existence of the department. Four students completed their M. Sc. degree, and fifteen new students were admitted into the M. Sc. provious class during the year.

Analysis of Students' Intake

	Male	Female	Total	ST	SC
M.Sc. (Prev.)	11	4	15	1	0
M. Sc. (Final)	5	1	6	0	0
M. Phil/Ph.D.	—	—	—	—	—

Publications

(1) Tunneling Motion of Dipolar Impurities in Alkali Halides : KBr : CN-System, A. L. Verma, J. Phys. *C*, Solid State Physics 13, 2009 (1980)

(2) Tunable Lasers and Resonance Raman Scattering A. L. Verma ; Ind. J. Phys. 54 B, 54-68 (1980).

(3) Rotational Isomers of Ethyl Dithio Acetate and Ethyl Thio acetate : A Raman Study ; A. L. Verma etal ; J. Raman Spectroscopy, 11, 390 (1981).

(4) Spin-Glass Dynamics in the Spherical Model, P. Shukla and S. Singh, J. Phys. C14, L81 (1981).

(5) A Quantum spherical Model of Spin Glass, P. Shukla and S. Singh, Phys. Lett. 81 A, 477 (1981).

(6) Classical and Quantum Spherical Models of Spin Glass : A Complete Treatment of Statics and Dynamics, P. Shukla and S. Singh, Phys. Rev. B23, 4661 (1981)'

(7) Elastic and Inelastic Scattering of 14 C by 14 C, D. Konnerth, K. G. Bernhardt, K. A. Eberhard, R. Singh, A. Strazalkowski, W. Trantmann, and W. Trombik, Phys. Rev. Lett. 45, 1154 (1980).

(8) Fluctuations in 12_C (16_O, 4_{He}) 24_{Mg} and 12_C (16_O, 8_{Be}) 20_{Ne} reactions, R. Singh, K. A. Elberhard, and R. G. Stokstad, Phys. Rev. C22, 1971 (1980)

(9) A new phonon frequency distribution function for quasi-two-dimensional systems, B. Dey and S. Singh, Phys. Lett. 81A, 147 (1981).

(10) Mass spectrimetry of metal compounds -Part I. Intnl. J. Org. Mass Spect., issue 16/7, 1981, D. T. Khathing with M. K. Chaudhuri, H. S. Das Gupta and M. Roy.

(11) Synthesis and structural studies of akali oxytetra fluorovanadates (v), Synth. React. Inorg. Metal-Org. Chem. 11, issue 7, (1981), D. T. Khathing with M.K . Chaudhuri, H. S. Das Gupta, and S. K. Ghosh.

(12) The direct synthesis of alkali penta fluoromanganates (III) J. Chem. Soc Dalton (London), in press D. T. Khathing with M. N. Bhattacharjee, M. K. Chaudhuri, and H. S. Das Gupta.

(13) Alkali oxytetra fluorovanadates (V), J. Inorg. Synth. (accepted in 1981 for vol. 22), D. T. Khathing with M. K. Chuaudhuri, H. S. Das Gupta and S. K. Ghosh.

Papers Published in Proceedings of Conferences and Symposia :

1. Raman Spectra and conformations of N' N'--Dimethyl Propargyl Amine, A. L. Verma, p-260. Heyden & Son (1980), Ed. by W. F. Murphy.

2. Spinglasses : Theoretical Status, P. Shukla, in Current Trends in Magnetism, eds. L. Madhav Rao, and M. S. Satya-Murthy, IPA (1981).
3. Spinglass dynamics in quantum spherical model. P. Shukla, Nucl. Phys. and Solid State Phys. 23C(1980).
4. Stability of Thouless-Anderson Palmar spinglass ordering, P. Shukla, Nucl Phys. and Solid State Phys. 23C(1981).
5. Studies in the spherical model of spinglass, P. Shukla and S. Singh, Nucl. Phys. and Solid State Phys. 23C (1980).
6. Scattering and Reactions of $^{14}C+^{14}C$ D. Konnerth K. G. Bernhardt, K. A. Eberhard, R. Singh, A. Stralkowski, W. Trantmann, and W. Trombik, Proceedings of the International Conference on Nuclear Physics, Berkeley, California, Aug. 24-30, Vol. I (1980).
7. Thermal and magnetic properties of quasi-one-dimensional magnetic systems, W. L. Basaiawmoit and S. Singh Nucl. Phys. and Solid State Phys. 23C (1980).
8. Electrostrictive effects in RbH_2PO_4, S. Singh, G. P. Singh, and B. K. Basu, Ferroelectrics 25, 519 (1980).
9. Science education in N. E. India-Meghalaya, Mizoram, and Nagaland, D. T. Khathing (in Press, Presented at National Seminar on N. E. India-Problems and Prospects of Development, April 27-May 1, 1981, Chandigarh Centre for Research in Rural and Industrial Development, Chandigarh).
10. The Role of Inelastic Channels for the Occurrence of Intermediate Resonances in $^{12}C+^{12}C$ and $^{14}C+^{14}C$W. Trombik, W. Trantmann, W. Dunnweber, K. A. Eberhard, W. Hering, D. Konnerth, and R. Singh, Havar Conference May (1981).

Collaboration with other Department/University/Institute

Prof. A. L. Verma visited the National Research Council of Canada, Ottawa from August 1 to October 10, 1980 as a visiting Scientist and studied some systems used as resonance Raman probes for monitoring catalytic transformation in enzymes.

Prof. Verma also visited the University of Amsterdam during his return journey to India and discussed some aspects of ongoing collaborative research programmes with Prof. J. van der Elsken.

Dr. Y. S. T. Rao had collaboration with Dr. S. K. Kataria, Nuclear Fission Group, BARC, on effective interactions in nuclear matter and related problems. He visited BARC during Dec. 20, 1980 to Feb. 5, 1981.

He also collaborated with Dr. S. C. K. Nair, Mr. C. Radha Krishnan, and Mr. M. C. Padmarai of Calicut University on effective interactions for nuclear spectrose and in termolecular forces.

Dr. R. Singh collaborated with the group of Prof. K. A. Eberhard and Prof. W. Hering, Sektion Physik, Universitat Munchen in the field of Heavy-Ion reactions. He visited Tandem Acceler Laboratory, University of Munich at Garching (W. Germany) from Jan. 1 to Feb. 28, 1981, as a Guest Physicist of Sektion Physik and participated in 16_0+14_C measurements on excitation functions and angular distributions.

Dr. S. Singh continued collaboration with Dr. B. K. Basu of the solid state physics group at TIFR, Bombay.

Dr. Y. S. Jain worked in collaboration with;

(i) Dr. B. N. Khanna, Reader, Department of Physics, A.M.U., Aligarh.

(ii) Dr. G. P. Srivastava, Professor, Department of Physics and Astrophysics, Delhi University, Delhi.

Dr. D. T. Khathing collaborated with

(i) Dr. M. K. Chaudhuri, Department of Chemistry, North-Eastern Hill University, Shillong.

(ii) Dr. A. Chatterjee, Bose Institute, Calcutta.
(iii) Dr. S. Gangadharan, B. A. R. C., Bombay.
(iv) Prof. A. J. Edwards, University of Birmingham, U. K.

Participation in Symposia/Seminars/Workshops.

Prof. A. L. Verma, Dr. Y. S. T. Rao, Dr. P. Shukla, Dr. R Singh, Dr. S. Singh, Dr. Y. S. Jain, Dr. D. T. Khathing, Dr. P. N. Pandita, as well as several students and research scholars of the department participated in the Conference on "Physics of Disordered Solids" organized by the department in March 16-18, 1981.

Professor A. L. Verma attended the 7th International Conference on Raman Spectroscopy, held at University of Carleton, Ottawa, Canada, from Aug. 4 to 9, 1980, and presented a paper. He also gave a seminar on "Atomic Tunneling in Solid" organized by the National Research Council of Canada, Ottawa in September., 1980.

Dr. Y. S. T. Rao, Dr. P. Shukla, and Dr. S. Singh participate in the D .A. E. Nuclear Physics and Solid State Physics Symposium held at I. I. T. Delhi during December., 1980.

He also participated in the Heavy Ion Accelerate Workshop held at B. A. R. C. Bombay in November 1980.

Dr. P. Shukla and Dr. S. Singh also attended the I. P. A. seminar on "Current Trends in Magnetism" held at I. I. T., Delhi during Dec. 8-10, 1980. Dr. Shukla chaired a session each in the D. A. E. symposium and the I. P A. seminar.

Dr. P. N. Pandita attended the 5th High Energy Physics Symposium, Cochin Dec. 26-30, 1980, organized by the DAE and the winter school in Theoretical High Energy Physics, Kalpakkam, Jan 1-14, 1981, organised by TIFR.

Department Of Chemistry

The department of Chemistry, a constituent of the School of Physical Sciences, completed the fifth year of its existence in July '81. The status of Chemistry as a principal discipline for scientific advancement justifies the inception of this department under the North-Eastern Hill University which has the development of intellectual and academic background of the hill areas as its objective. This region being rich in natural resources demands a special emphasis on disciplines such as Chemistry to train students to achieve competence to utilize these resources for its economic development. Keeping this aspect in view the teaching programmes of the department are oriented to provide a unified perspective of both theoritical and practical knowledge of all the modern aspects of Chemistry, special emphasis being given to the application of Instrumentation for structural elucidation and analytical determination. A survey of the placement of ex-students of the department is a vindication of potential of the implemented courses structure to provide competent scientific personnel.

Analysis of Students' Intake :

Batch No.	Year of Study	No. of students who completed			SC / ST
		Male	Female	Total	
I	1981-83	11	9	20	2
II	1980-82	9	3	12	2

(a) A break-up of the number of Research Students of th Department.

Sl. No.	Category	No. of Students		Total	ST
		Male	Female		
1.	Ph. D Students (Full-time).	13	2	15	2
2.	Ph. D. Students (teacher candidates from affiliated colleges).	8	–	8	–
3.	Post-Doctoral Fellows	1	–	1	–

PUBLICATIONS :

List of Research Papers published by the members of the Faculty during the academic year 1980-81.

1. Polarised Keten N, N-and S. N. Acetates as Novel Enamine Components for the Neutzesene Indole Synthesis, V. Aggarwal, A. Kumar, H. Ila and H. Junjappa, *Synthesis,* 157 (1981).
2. Reaction of Aromatic Amines with -Chloroacrylonitrile : A convenient two step synthesis of N-Aryl-2-Cyanoazendene using a phase transfer catalyst, S. Apparao, A. Kumar, H. Ila and H. Junjappa, *Synthesis,* 623 (1981).
3. Quantitative Seperation of calcium and phosphate through a potentiometric Hg-EDTA Titration, T. S. B. Narasaraju, U. S,Rai, P. Lahiry and P. R. Ram. Acta Pol. Pharm. 38, 383 (1981).
4. Transference number of charge-transfer complexes in solution : Methadol iodine and Ethanol - iodine, S. N. Bhat and Rajeev Dwivedi, Proc. Ind. Acad. Sci, 89, 337 (1980).
5. Evidence of C-O cleavage in Effect of Temparature on the Mass Spectra of MN(CO)5 Cl. M. K. Chaudhuri, H. S. Dasgupta, N. Roy and D. T. Kathing, Ogr Mass Spectrometry, 16, 303 (1981).
6. The Direct Synthesis and Characterization of Alkali Metal Hexafluorochromates (III) M_3CrF_6, M. K Chaudhuri and N. Roy, Synth. React, Inorg Metal-Org. Chem. 11, 7th issue (1981).
7. The direct synthesis of Alkali Pentafluoromanganates (III) M.N. Bhattacharjee, M.K. Chaudhuri, H. S. Dasgupta and D. T. Kathing, J. Chem Soc, Dalton Trans., 2587 (1981)
8. Novel synthesis of Alkali Metal Trifluorochromates (VI), M. K. Chaudhuri, H. S. Dasgupta and N. Roy, Ind. J. Chem., 20. (1981).
9. Alkali Oxytetrafluorovanadates (V), M. K. Chaudhuri, H. S. Dasgupta, S. K. Ghosh and D. T Kathing, Inorg, Synthesis, Vol. 22. In press (1981).

10. Prediction of Reaction Sites in Fulvenes and Fulvalenes, M. K. Mahanti, Ind, J. Chem. 20B, 407 (1981).
11. Spectrophotometric Determination of Fe(III), Co (II), and Ni(II) by complexation with 2-(p-sulphophenylazo) -1, 8-Dihydroxynaphthalene-3. 8-Disulphonic acid, A. K. Bhattacharjee and M. K. Mahanti, Ind. J. Chem. 20A, 427 (1981).
12. Linkage Isome-rism of NCS-Group in Ruthenium Complexes R. K. Poddar, R. Prasad and U. Agarwala. J. Inorg. Nucl. Chem., 42, 837 (1980).
13. On the additivity of Molar volume and Refractivity of Molten $Ca(NO_3)$ 2. 3. $18_{H2}{}^{4}O$-KSCN system, S. Mahiuddin and K. Ismail, Bull, Chem. Soc., Japan 54, 2525 (1981).
14. Trace -Elemental Analysis of Extracted Dust from Lungs Lymph Nodes of Domestic Animals using X-Ray Fluorescence Technique, K. K. Dwivedi, M. S. Prasad, G. N. Rao, R. K S. Dogra, R. K. Upreti, Ravishankar, C. R. Krishnamurti, S.S. Kappor, Madan Lal and K. V. Vishwanathan, Int. J. Environ. Anal. Chem. 7, 205 (1980).
15. Trace Element Analysis using Energy-Dispersive X-Ray Fluorescence Techniques, Veena Joshi, K. K. Dwivedi, Prem Sagar, R. M. Singru and G. N. Rao, Trans. I. I. M., 34, 372 (1981).
16. Electron Spin Resonance Studies of some Ruthenium (III) complexes O. K. Medhi and U. C. Agarwal, Inorganic Chemistry, 19, 1381 (1980).
17. Synthesis, Characterization and Physical Studies on Bromotropolonato complexes of Ru(III), O. K. Medhi and U. C. Agarwal, J. Inorg. Nucl. Chem., 42, 1385 (1980).

Title of research projects sanctioned to Faculty members by external funding agencies which are in progress during 1980-81.

(1) **Prof. T. S. B. Narasaraju**

"Preparation and characterization of apatities for use as ion ex-changers for the removal of toxic ions" (UGC).

(b) "Absorption Studies for Removal of Toxic Ions from Industrial waste. In collaboration with Prof. M. S. Narayanaswamy, Civil Engg. Department, BHU, Varanasi (UGC).

(c) "Project Amophous Alloys" in collaboration with Prof. T. R. Anatharaman, Department of Metallogical Engg., B H. U. (DST).

(2) **Dr. J. Subramanian :**
"Electrochemical and ESR studies on Metallo-Porphyrins (CSIR).

(3) **Dr. (Mrs) H. Ila :**
"Synthetic Studies on stabilized allylic and azaallylic carbonions" (UGC : CAREER AWARD).

(4) **Dr. S. N. Bhat :**
"Charge transfer interaction of biomolecules" (UGC).

(5) **Dr. M. K. Mahanti :**
"Kinetics of Oxidative Cylizations of Heterocyclic Molecules containing Amine, Imine and Thiol funtions" (UGC).

Participation of Faculty members in National/International Seminars and Symposia during 1980-81.

Sl. No.	Name	Title of Paper/talk	Venue
(1)	(2)	(3)	(4)
1.	Prof. H. Junjappa	* (i) Synthetic utility of polarised Ketene dithioacetals : A New Class of Stable Vinylamides and Amines.	University of Madras Symposium on New Reagents Reactents and Rearrangements.
		* (ii) Polarized Ketene dithioacetals, Their S. N. and N.N. Analogous : A New Class of Novel synthetic Intermediates.	Chemistry Department University College, Calcutta, Fifth National Symposium in organic Chem.

2. Dr. (Mrs) H. Ila	* (i) Polarized Ketene S.N. and N.N, - Acidital : A New Class of Vinylamides.	Medicinal Chem. Div. CDRI, Lucknow.
	* (ii) Polarized Ketene S.N. and N. N. - acital : A New Class of Vinylamides.	Chemistry Department, University of Delhi.
	* (ii) Synthetic utility of cyanotrimethylammonium methylird.	Chemistry Department University College of Science, Calcutta, Fifth National Symposium.
	(iv) Synthesis of polarized keten N.N. - and S.N. Diacetals as potential Enamine Components 6- Hydroxy Indole Synthesis.	Annual convention of chemist 1980. I.I.T. Bombay
	(v) Synthesis of 3 [Bis (Methylthio) -/- 2cyano Methyl -1 phenyl -2-propen-1-one and their reaction with Primary Amines: A New General Method for 2- Amino Pyrroles.	Annual Convention Chemists, 1980. I.I.T. Bombay.
3. Dr. S.N. Bhat	(i) Kinetics of Transformation of outer charge-transfer complexes to inner complexes.	Annual Convention of Chemists 1980. I.I.T., Bombay.
	(ii) Transport number of chargetransfer complexes in solution.	—do—

* Invited Lectures :

4.	Dr. M. K. Chaudhuri	(i) Novel Synthesis of Alkali metal Bifluorides and their use as Fluorinating agents.	—do—
		(ii) Some novel features in the mass spectra of chloropentacarbonylmanganese(I), $Mn(CC)_5Cl$	—do—
5.	Dr. M. K. Mahanti.	Kinetics and mechanism of oxdation of Methoxytoluenes by potassium bexacyanoferate (III) in acid medium.	—do—
6.	Dr. K. Ismail	A Hydration model for the concentration dependence of viscosity in Electrolyte solution ; $Ca(No_3)_2$ $--H_2O$ system.	National Academic of Science Meeting Calicut.
7.	Dr. K. K. Dwivedi	Energy Dispersive X-Ray Fluorescence Technique and its applications to Trace Element Analysis of Environmental Samples	International Symposium on Trace Analysis and Technological Development BAS Bombay.

Department of Mathematics

The Department of Mathematics, a constitutent unit of the School of Physical Sciences, has completed the seventh year of its existence in August, 1981. The department aims at the welfare of the people of the North-Eastern Region, in particular, their intellectual, academic and cultural uplift by (i) imparting good grounding in Mathematics, (ii) providing facilities to students in fields like statistics, numerical anylysis, operation research and other applications of mathematics which are suited to jobs in this region and to jobs likely to come up in this region in near future and (iii) developing a strong centre of advanced research in mathematics so as to enable this region to play a significant role in the scientific development in India and abroad as well.

The Department at present offers M. Sc., M. Phil and Ph. D programmes.

Analysis of students' intake :

Courses	Male	Female	SC	ST	Total
M.A./M.Sc. I and II Semester	23	4	1	2	27
M.A./M.Sc. III and IV Semester	10	3	0	2	13
M. Phil	—	—	–	–	—
Ph. D.	2	0	0	0	2

Research Publications of faculty members :

1) S. S. Khare and S. P. Choudhury : A note on quotients of finitistic spaces, accepted for publication in Indian Journal of Mathematics.

2) S. Ramasubramanian (jointly with R. N. Bhattacharya) Recurrence and ergodicity of diffusions, accepted for publication in J. Multivariate Analysis.

Research Activities of the Department :

In March 1981, the department admitted Mr. A. B. Chakravarty and Mr. N. J. Deb, Mathematics teachers from Lady Keane College, Shillong to its Ph. D. Programme.

In September 1980, Mr. P. K. Sakia's Ph. D. thesis on "Matrix of Local Zeta Functions for lattices over orders in a quadratic field", under the supervision of Prof. L. Solomon, was accepted by the University of Wisconsin.