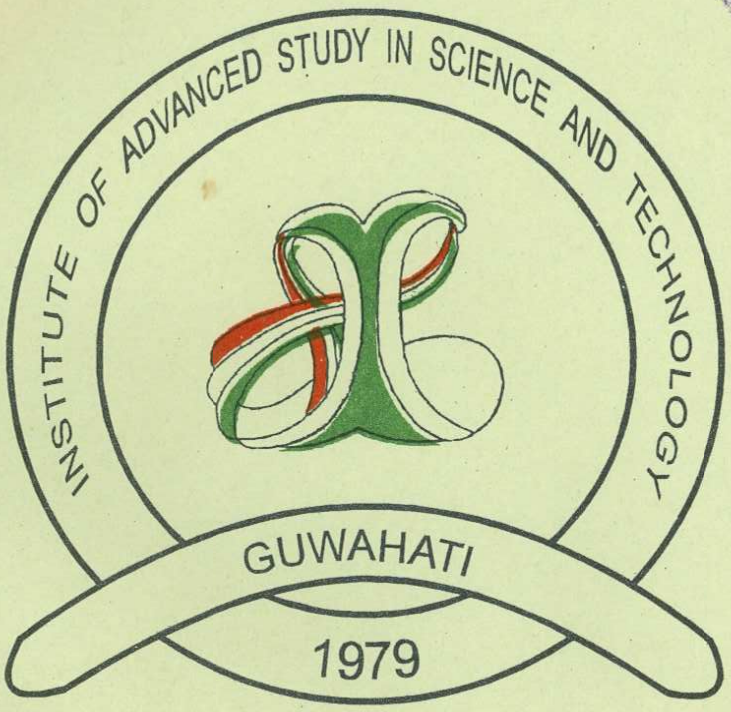
ANNUAL REPORT

APRIL, 1997 - MARCH, 1998

Institute of Advanced Study in Science & Technology
IASST
Date 25/6/99
Guwahati-22



INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
KHANAPARA, GUWAHATI - 781 022
ASSAM (INDIA)

Date 27/6/99

ANNUAL REPORT

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INSTITUTE OF ADVANCED STUDY
IN SCIENCE AND TECHNOLOGY
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CONTENTS

Foreword

The Institute of Advanced Study in Science and Technology has completed nearly eight years of its independent existence and has been carried out research and training in its five divisions, namely, Plasma Physics, Life Sciences, Mathematical Sciences, Resource Management and Environment and Computer Science. The activities of all these divisions, during the year 1997-98, have been incorporated in this Annual Report.

The Institute has been passing through critical phases, as during the year 1997-98 it has not received the maintenance grants from the Govt. of Assam.

We are thankful to the Department of Science & Technology, Govt. of India, Department of Biotechnology Govt. of India, Ministry of Environment and Forests, Govt. of India and Assam Science Technology and Environment Council for financial support to various on going research projects of the IASST.

I want to offer my thanks to all the members of the Academic, Scientific and Administrative staff of the IASST for their full co-operation and timely help without which it would not have been possible to carry out research and training activities of the Institute.

Prof. K.C. Barua
Director

Members of the Council 1997 April - 1998 March

1. Dr. N. K. Choudhury, Chairman
Former Vice - Chancellor, Gauhati University ,
Rukminigaon , Guwahati .

2. Dr. K. C. Barua
Director , IASST

3. Prof N. Irabanta Singh,
Head Deptt., Life Sciences,
Manipur University ,Imphal.

4. The Director,
Regional Reserch Laboratory,
Jorhat ,

5. Dr. B. P. Chetia .
Prof. , Deptt of Mathematics,
Gauhati University ,Guwahati

6. Dr D. K. Sarma,
General Secretary , Assam Science Society,
Latasil , Guwahati.

7. Dr. K. Pathak
President , Assam Science Society ,
Latasil, Guwahati.

8. Dr. Barindra Kr. Sarma,
Reader, Department of Physics,
Gauhati University, Guwahati.

9. The Secretary,
Deptt. of Education,
Govt. of Assam, Dispur,
Guwahati.

10. The Secretary,
Deptt. of Science, Technology & Environment,
Dispur, Guwahati.

11. The Director,
Technical Education Assam,
Kahilipara, Guwahati.

12. Director,
Ministry of Science & Technology,
DST, Govt. of India,
Technology Bhavan, New Mehrauli Road,
New Delhi - 110 016.

13. Prof. P.Sen,
Saha Institute of Nuclear Physics,
Bidhan Nagar, Calcutta - 700 064.

14. Dr. K.C. Deka,
Director, ASTEC., Silpukhuri, Guwahati.

15. Dr. N.N. Dass,
Professor, Deptt of Chemistry,
Dibrugarh University, Dibrugarh - 786 004

16. Dr. G. Barua,
Prof. & Head, C.S.E.,
IIT, Guwahati, Guwahati-781 001.

17. Dr. Joyanti Chutia,
Associate Professor,
Plasma Physics Division,
IASST.

18. Dr. M.K. Kalita,
Administrative Officer,
IASST, Khanapara.

Secretary.

STAFF

Director	-	Prof. K.C. Barua

PLASMA PHYSICS DIVISION

Academic Staff

1. Dr. Joyanti Chutia	-	Associate Professor
2. Dr. G.C. Das	-	- do -
3. Dr. C.B. Dwivedi	-	Assistant Professor
4. Dr. H. Bailung	-	- do -

Scientific Staff

Sri Arun Kr. Sarma	-	Research Associate (under project)
Dr. ABR Hazarika	-	- do - (under project)

Technical Staff

1. Sri Amal Kalita	-	Technical Assistant (under project)
2. Sri K.K. Swargiyari	-	Mechanic

Maintenance Staff

1. Sri Kabindra Deka	-	Laboratory Attendant
2. Sri Bipul Das	-	Messenger

Research Scholars

1. Sri Ram Prakash Lavania	-	JRF
2. Ms. Barnali Sinha	-	JRF
3. Sri B. Handique	-	JRF
4. Sri Jnanjyoti Sarma	-	Part time
5.Ms. Madhuri Talukdar	-	- do -
6. Sri Santanu Baishya	-	- do -

LIFE SCIENCE DIVISION

Academic Staff

1. Dr. J.N. Talukdar	-	Honorary Professor (P.I.)
2. Dr. P. Azad	-	Assistant Professor
3. Dr. J. Kotoky	-	- do -
4. Dr.(Mrs.) Dipali Devi	-	- do -
5. Dr. P.N. Das	-	Co-Investigator (under project)

Scientific Staff

1. Mrs. R.L. Devi	-	Senior Research Assistant
2. Mrs. J. Bordoloi	-	Laboratory Assistant
3. Sri S. Goswami	-	- do -
4. Sri D. Deka	-	- do - (under project)
5. Sri R. Kalita	-	Research Assistant (under project)
6. Sri Niren Sarma	-	Research Assistant cum animal keeper (under project)

Technical Staff

1. Sri P. Das	-	Senior Technical Assistant

Maintenance Staff

1. Sri G. Gupta	-	Laboratory Attendant
2. Sri T. Talukdar	-	- do -
3. Sri B.Das	-	Field Helper
4. Mrs. M. Pathak	-	Animal Keeper

Research Scholars

1. Sri D. Duarah	-	JRF
2. Sri J. Gogoi	-	JRF
3. Sri A. Deka	-	JRF
4. Md. S. Talukdar	-	JRF
5. Sri R. Saikia	-	JRF

MATHEMATICAL SCIENCE DIVISION

Academic Staff

*1. Prof. J. Medhi	-	Honorary Professor
2. Dr. A.K. Agarwal	-	Professor
3. Dr. B.K. Tripathi	-	Associate Professor
4. Dr. K.K. Das	-	Assistant Professor
5. Dr.(Mrs.) M.R. Agarwal	-	- do-
*6. Sri D.N. Das	-	Chief Statistician

Maintenance Staff

1. Sri Ratul Baishya	-	Messenger
*2. Sri M. Hazarika	-	Investigator
*3. Sri S. Dey	-	- do -
*4. Sri S. Baishya	-	Messenger

*Man Power Study Cell (project)

Research Scholars

1. Smt. Barnali Dutta	-	JRF
2. Smt. Sangeeta Kalita	-	JRF
3. Smt. Mousumi Sen	-	JRF

RESOURCE MANAGEMENT & ENVIRONMENT DIVISION

Academic Staff

1. Dr. S.Deka	-	Assistant Professor

Scientific Staff

1. Smt. Arundhati Devi	-	Sr. Research Assistant
2. Sri Manomohan Hujuri	-	Technical Assistant (under project)

Maintenance Staff

1. Sri Madan Kalita	-	Messenger

Research Scholars

1. Sri P. Sarma	-	Part time Scholar
2. Sri U. Medhi	-	- do -

COMPUTER SCIENCE DIVISION

Academic Staff

1. Sri A. Barman	-	Assistant Professor
2. Sri B. Bora	-	- do -
3. Smt. L.B. Mahanta	-	- do-

Technical Staff

1. Sri N. Bhagabaty	-	Sr. Instructor
2. Smt. M. Talukdar	-	Instructor
3. Sri Bubu Bhuyan	-	- do -
4. Sri M. Singh	-	Console Operator

Administrative & Maintenance Staff

1. Smt. S. Bora	-	LDA
2. Sri N. Goswami	-	Messenger
3. Smt. M.Das	-	Cleaner
4. Sri H. Medhi	-	Night Chowkidar

ADMINISTRATIVE STAFF

1. Dr. M.K. Kalita	-	Administrative Officer
2. Md. A. Majid	-	Finance & Accounts Officer
3. Sri R. Sarma	-	Public Relation Officer
4. Sri P.K. Deka	-	UDA
5. Sri S. Sarma	-	Accountant
6. Sr R. Mahanta	-	Jr. Accountant
7. Sri R. Kalita	-	LDA
8. Sri D. Deka	-	- do -
9. Sri P. Barma	-	- do -
10. Sri D. Das	-	Stenographer
11. Sri T.D. Goswami	-	Assistant Librarian
12. Sri K. Baishya	-	Library Assistant

Maintenance Staff

1. Sri N. Hazam	-	Driver
2. Sri U.C. Deka	-	Messenger
3. Sri B.C. Deka	-	- do -
4. Sri B. Chaudhury	-	- do -
5. Sri S. Das	-	Day Chowkidar
6. Sri L.K. Saud	-	Night Chowkidar
7. Sri B. Pathak	-	Chowkidar (land)
8. Sri M. Kalita	-	Electrical Jugali cum laboratory helper
9. Sri M. Bosfor	-	Sweeper

RESEARCH AND DEVELOPMENT ACTIVITIES

PLASMA PHYSICS DIVISION

The Plasma Physics Division has been carrying out research activities in both experimental and theoretical studies in different fields, namely, Non linear Phenomena, Waves and instabilities, Sheath Phenomena, Dusty Plasmas and Space Plasmas. The group has recently started to work in Plasma Processing also.

The theoretical work mainly conderns the following areas :

1. Nonlinear wave phenomena centred around soliton dynamics etc. in multicomponent plasmas especially in the presence of negative ions.
2. Instabilities of nonlinear wave phenomena in relation to the experimental Plasmas as well as in space Plasmas.
3. Nonlinear wave dynamics in dusty Plasma.
4. Nonlinear wave dynamics in magnetised Plasma.
5. Numerical observations of the nonlinear wave dynamics.

So far the soliton dynamics is studied experimentally in multicomponent Plasma with negative ions too and it bridges a close relation between theoretical and experimental observation. Moreover, some special characteristics of non linear waves, known as spiky and bursting solitary waves, have been observed theoretically, but such observations are yet to be stabilised in laboratory Plasmas. Some of the theoretical observations support the recent observation made by the Trexa scientific satellite showing the compressive and rarefective solitary waves in space Plasmas.

The discovery of a new Plasma sound mode namely the So-called Acoustic Mode in 1989 has now become a subject matter for an international debate in Plasma Physics community. It is further argued that the dust acoustic wave, in principle, should be termed as a low frequency version of the So-called Acoustic Mode. Very recently [1,2] two research articles have appeared in the literature to strengthen the authors own views regarding the novelty as the So-called Acoustic Mode. The basic quality as the So-called Acoustic Mode is that a drastic deviation from the conventional electrodynamical response of a given parent Plasma particles on the reference acoustic time scale (RATS) occurs due to presence of the impurity ions [3,4] in the given parent Plasmas. This (deviation) happens due to effective inertial enhancement of the impurity ions through either mass scaling or density scaling or by both at a time.

As a consequence an inertially stretched new acoustic time scale becomes likely in multispecies Plasma with more than one ion species. In the case of normal impurity ions, the required thermal scaling between the impurity ions and the parent ions is not a common occurrence and hence needs an appropriate arrangement to produce and maintain the

required thermal scaling. However, a dusty Plasma system offers a natural Plasma medium to fulfill the required thermal scaling. The details about the So-called Acoustic Mode can be found in the literature [1,2].

Recently, a numerical simulation has revealed the existence of a statistical mode of dust charge fluctuation in equilibrium which arises due to consideration of discrete character of the Plasma currents collected by the Plasma grains during their charging process in Plasma medium. This effect is more prominent for nanoscale dust grains. A simple theoretical model of parametric coupling has been proposed to account for the equilibrium dust charge fluctuation while carrying out the normal mode analysis to characterise the normal plasma eigen modes. It is found that the equilibrium dust charge variation can destabilise the Plasma eigen modes through parametric resonance coupling between the dust charge oscillator (DCO) mode or to say the statistical mode of oscillatory dust charge and the Plasma eigen modes of interest.

This is suggested that the proposed physical mechanism of a parametric resonance coupling to produce Plasma turbulence could be used for the dusty Plasma diagnostics and also for the purpose of an acoustic amplifier based on the Plasma phenomenon in multispecies plasmas containing the dust grain like impurity ions. However, highlights have been given on the future scope of work for model improvements.

Finally, a simple mathematical approach of travelling wave formulation (TWF) has been first time applied to solve the Burgens equations [3] for a shock wave characterisation in dust Plasmas. The successful recovery of the known results motivates for further study of the TWF in the context of other known nonlinear equations with scalar and / or vector types of nonlinearity.

As far as experimental work is concerned, a new experimental setup was installed with a view to studying sheath related Nonlinear Phenomena in magnetised Plasma. For this purpose, the magnetic coils were wound around the body of the chamber. The chamber is evacuated up to 2×10^{-6} Torr. The coils can produce 800 gauss of magnetic field by passing 25 amperes current through it. The nonlinear phenomena of Sheath in magnetised Plasma has been carried out in this system.

The experimental study of Sheath Phenomena in multicomponent Plasmas in the Double Plasma Device was undertaken.

The observations show that :

1. The sheath thickness increases with increase of negative ion concentration.
2. The Sheath structure follows the modified Child's law.
3. The frequency of the excited low frequency instability decreases with addition of negative ions.
4. The effect of the ion beam shows that the instability is excited within certain ratio of the velocities between the ion beam and the bounced ions inside the Sheath.

The observations of a low frequency electrostatic waves in negative ion Plasma was also made by exciting the Plasma with a tone burst signal.

The dispersion relation was derived and it shows the change of ion acoustic velocity due to the presence of negative ions. The slow mode is observed experimentally whose frequency decreases fast with addition of negative ion concentration but it nearly saturates after a critical concentration of negative ion to positive ion.

Research Publications :

1. C.B. Dwivedi, Phys. Plasmas 5 (1998) 1222
2. C.B. Dwivedi, Phy. Plasmas 5 (1998) 1227
3. G.C. Das, C.B. Dwivedi, M. Talukdar and J. Sarma, Phys. Plasmas 4(1997) 4236
4. C.B. Dwivedi, "Discrete charging model and parametric excitation of the So-called acoustic mode in dusty Plasmas to appear in sept. 1998 issue of Phys. Plasmas"
5. "Sheath Phenomena in Plasmas" Joyanti Chutia, Phys. News. 28 146 (1997).
6. "Observations of Sheath Phenomena in multicomponent Plasma with negative ions". B.K. Sarma, A. Sarma, H. Bailung, Joyanti Chutia. Physics letter A 244, 127 (1998).
7. "Solitary waves and corresponding double layers in relativisic Plasma with multicomperative electrons".
8. "Characteristics behaviors of solitary waves in relativistic Plasma". G.C. Das and K.M. Sen. Indian J. Pure and applied phys., Vol.36, p. 300, 1997.
9. " A new mathematical approach for stock wave solution in a dusty Plasma", G.C.Das and C.B.Dwivedi, M.Talukdar and J. Sarma. Physics of Plasmas, Vol. 4 p.42, 1997 (Dec.)
10. "Explosion of soliton in a multicomponent Plasma" G.C.Das, J.Sarma and C. Uberoi., Physics of Plasmas, Vol. 4 p.2095, 1997.
11. "Quasipotential analysis for ion acoustic solitary waves and double layers in Plasmas". G.C.Das, S.G.Tagare and J. Sarma. Planetary and space Science, 45. 1998.

Papers Presented in Conference :

1. "Transient behaviors of solitary waves and double layers in Plasmas" G.C. Das and Sarma. J, 8th Manipur Sc. Congress, 1997.
2. "Some characteristics behaviour of Plasma acoustic waves in dusty Plasma". Das.G.C., Sarma. J. and M. Talukdar. XII PSSI, Dec. 1997.
3. "Some aspects of solitons behaviors and double layers in multicomponent Plasma". G.C.Das and M. Talukdar. 8th Manipur Sc. Congress, 1997.
4. "Possibility of weakly charged nonlinear clouds near the certain limit of dust population in a quasi neutral Plasma". Baishya. S.K., Chutia. J. Kalita. M.K. Das. G.C. and Dwivedi. C. XII PSSI, Dec. 1997.
5. "Sheath characteristics in Multicomponent Plasmas" B.K. Sarma and Joyanti Chutia, Plasma 97, Ahmedabad PPA-06.
6. Experimental and theoretical investigation of Plasma sheath properties in negative ion beam plasmas. H. Bailung, Joyanti Chutia, C.B. Dwivedi and G.C. Das, Plasma'97, Ahmedabad.

VISIT OF SCIENTISTS TO OTHER INSTITUTIONS:

1. Dr. Joyanti Chutia visited the Ion Physics laboratory, Innsbruck in April'97 and delivered one lecture on Characteristics of sheath instabilities in a double Plasma Device in the Plasma Physics group of the laboratory.
2. Dr. H. Bailung has been awarded the Boyscast fellowship by the DST, Govt. of India to visit ISAS, Japan for a period of 10 months with effect from March'98 to carry out research work in "Plasma Diagnostics".

PARTICIPATION IN SEMINAR, CONFERENCE ETC.

1. Dr. C.B. Dwivedi participated and delivered an invited talk on "Low frequency mode waves in Dusty Plasmas" in the 12th National Plasma Symposium held at Ahmedabad, during 2-6 December'97.
2. Dr. Joyanti Chutia participated and delivered a talk on "Observation of Sheath Phenomena in Multicomponent Plasmas" in the 12th National Plasma Symposium held at Ahmedabad during 2-6 December'97.
3. Dr. C.B. Dwivedi participated and delivered an invited talk (on "Low frequency waves and oscillations in dusty Plasmas") in XII National Symposium on Plasma Science and Technology organised by IPR, Gandhinagar during Dec. 2-5, 1997.

Seven research papers were presented by Dr. Dwivedi in the symposium. Out of these, two research papers were identified for national level assessments, one under best poster presentation and the other under best oral presentation.

Ph. D. THESES:

1. Mr. Anjan Buragohain, part time research worker under the guidance of Dr. Joyanti Chutia was awarded the Ph. D. degree for his thesis "Study of Chaotic Instabilities in Ion beam Plasma System" by the Gauhati University.
2. Mr. Arun Sarma, SRF working under the guidance of Dr. Joyanti Chutia has submitted his thesis entitled "Study of Sheath Instabilities in Laboratory Plasmas" for Ph. D. degree of Gauhati University.

VISITORS :

Shree Jeevan Jyoti Nakrani from Tribhuvan University, Nepal visited the Plasma Physics from 23rd May'97 to 7th June'97 and carried out a research problem "A comprehensive physical model of a self-gravitating dust-plasma cloud with weak rotation". He delivered a talk also on the above subject.

Any other important activity:

Efforts are directed to nucleate a group of interdisciplinary workers through collaborative research activities in front areas of the interdisciplinary subject in Plasma Physics and in other fields of interest and applications in Plasmas.

MATHEMATICAL SCIENCES DIVISION

Approved Objectives of Proposal :

- To carry out and sustain high quality research in some selected areas in Mathematics & Statistics.

- To develop the Division to a Standard Level with adequate infrastructures facilities conducive for research in Mathematical Sciences in this region and attract the talented scientists from the region.
- To develop the Division into a center of excellence in Mathematical Sciences to meet the aspirations of young talents of the NE Region.

- Methodology :

In number theory we have defined self conjugate plane partitions using Knuth's correspondence while the work in the theory of summability is chiefly based on introducing new sequence spaces and generalizing some existing sequence spaces. In Statistics a class of generalized poisson distribution is defined introducing a new generalized exponential class of sums. In harmonic analysis the work is entirely based on the use of continuous irreducible unitary representations of [z] groups and the use of structure theory of these groups.

Summary of Progress :

The Mathematical Sciences Division, IASST has three faculty members and three research scholars. They have great research potential as is reflected by the amount and quality of the research work they have done so far. Below are given particulars of the work done by them during 1997-98.

Publication :

1. A.K. Agarwal, Plane partitions, Proc. Of NERCOM, (1997), 35-46.
2. A.K. Agarwal, A note on self conjugate n - Color partitions, International Journal of Mathematics and Mathematical Sciences, to appear.
3. B.C. Tripathy, On statistical convergence, Proc. Estonian Academy of Sciences, to appear.
4. B.C. Tripathy, Matrix transformations between series and sequences, Bull. Malasian Mathematical Society, to appear.
5. K.K.Das (with S.B. Nandi and D.C. Nath), A class of generalized Poisson distribution, statistica, to appear.
6. M.R. Agarwal; (with U.B. Tiwari), A characterization of a class of [z] groups via Korovkin Theory, Rend. Circ. Mat. Palermd, to appear.

New Observations:

In number theory analogues of two well known theorems of classical partition theory are obtained for plane partitions. In the theory of summability the relationship of the Statistically monotonic sequences with the completeness axioms is studied. In statistics the suitability of a generalized Poisson distribution, where the population is supposed to be Poissonian but the mean and variance are not equal, is seen. In harmonic analysis it was found that the centre z (Lw(G)) of the Beurling algebra admits a finite universal Korovkin set if and only if G is a separable metric space of finite dimension and w has rate of growth equal to one, here G is a [z] group and w is a symmetric weight function of G.

7.2. Innovations :

MacMahon's definition of compositions has been extended to n-color compositions. It has been shown that these new compositions arise as solution of certain combinatorial problems. The erroneous definition of statistical monotonic sequences has been corrected. Statistical convergence fields, statistically bounded sequences and statistically convergent series have been introduced.

7.3. Application Potential :

7.3.1. Long term : Like MacMahon's compositions we hope that our n - color compositions will find many applications in number theory and combinatories. It is hoped that the work done in the theory of summability will find relationships with functional analysis and topology. The result obtained in harmonic analysis answers the question asked by M. Pannenberg in 1989, in the context of the centre of Beurling algebras.

7.3.2. Immediate :
The introduction of 'self - conjugate plane partitions' and 'n - color compositions' will provide many research problems for researchers to work on. Extension of sequence spaces has been done. The work done in harmonic analysis gives a finite universal Korovkin Set in Z (L w (G)). The number of elements in this set is n+v+4, where n and v are certain positive integers (depending on G).

1. Prof. A.K. Agarwal delivered an invited lecture on "Plane Partitions" in the NE regional Conference on Mathematics, Gauhati University, April 25-26, 1997.
2. Prof. A.K. Agarwal delivered an invited lecture on "Rogers-ramanujam identities for generalized F-partitions"in an "International conference on discrete Mathematics and Allied topics" organized by the Academic Forum at Bahadurgarh, Nov. 10-13, 1997.
3. Prof. A.K. Agarwal participated in the 63rd Annual conference of the Indian Mathematical Society held at Ahmednagar, Dec. 27-30, 1997. He chaired two academic sessions.
4. Prof. A.K. Agarwal delivered IIT, Guwahati colloquium talk entitled "Rogers Ramanujam identities" on March 12, 1998.
5. Dr. B.C. Tripathy presented his paper "On statistically convergent and statistically bounded sequences" in the "International conference on Recent Developments in Mathematical Analysis with Applications to Industry Problems", BHU, March 2-5,1998.

6. Dr. K.K.Das and Miss S.Kalita presented their paper "Generalized factorial series distribution : A general model of discrete probability distribution" in the "National seminar on Advancing Frontiers in Statistics and Operation Research, Dibrugarh University Sept. 22-24, 1997.
7. Dr. K.K.Das presented his paper (with N.Bhattacherjee) " Some aspects of modified factorial series distributions" in the "International Conference on discrete Mathematics and allied Topics" organized by the academic forum, Bhadurgarh, Nov. 10-13, 1997.
8. Dr. M.R.Agarwal participated in the "Sixth Discussion Meeting on Harmonic Analysis" held at ISI, Calcutta, Jan 22-24, 1998.

9. Other Academic Activities :

1. A North East regional conference on Mathematics was held at Gauhati University during 25-26 April, 1997. Prof. A.K.Agarwal was a member of the Organizing Committee and also an invited Speaker in the panel discussion on - Development of Mathematical Research in N.E. Region - Problems and remedies.

Visitors :

1. Prof. J.N. Kapoor, JNU, N.Delhi, April 24, 1997.
2. Prof. K.B. Sinha, ISI, N. Delhi, October 21, 1997.
3. Prof. (Mrs.) Padmavathamma, Univ. of Mysore, Oct. 20-Dec.20, 1997.
4. Prof. Rauno Aulasari, Univ. of Joensuu, Finland, Dec. 18, 1997.
5. Prof. Jukka Pihko, Univ. of Helsinki, Finland, Feb. 7. 1998.

The Manpower Cell :

Current Activities :

This cell of the IASST is devoted to undertaking studies, primarily relating to Science & Technology Manpower information for the N.E.Region. The cell has already completed an elaborate DST funded study on :"Availability & requirement of S&T Manpower for Assam during the next 20 years" and is currently implementing another DST sponsored project entitled (i) Utilisation pattern and career profile of the Post-graduates and the Ph.Ds in Science and Technology produced by the universities of the N.E. Region, and (ii) the extent of R&D activities undertaken by the Ph.D. faculty members in the higher educational institutions in N.E. Region since February 1996 with Professor J.Medhi as the Principal Investigator and Shri D.N. Das as Co-Principal investigator. The project is of 27 months duration (February 96 to April 98) with an approved outley of Rs. 6,99,650/-. The scheme is nearing completion eg. the field work and data processing works already completed, report writing is in an advance stage of completion.

The Report (in final printed form) is being submitted to the sponsoring organisation DST early in 1997-98.

Proposed Activity :

The cell proposes of undertaken next another project having important bearing on the development of S&T manpower in the NE Region Viz. "Study on the performances of S&Tstudents of NE Universities in selected National Eligibility Test. The performances of the students of the NE universities in various All India competitive examinations are generally known to be dismal. No study has ever been conducted to identity the actual performances or to know the causes leading to such unsatisfactory results. This elaborate study has been formulated keeping in view these needs. The project since submitted (vide No. IAAST/168/97-98/2424, dated 12.1.98) to the DST. Govt. of India for approval and funding, intends to cover initially the NET, GATE and the ARS. The anticipated duration of the project is 36 months and is estimated to cost Rs. 14.93 lakh.

LIFE SCIENCES DIVISION
BIOFERTILIZER

A research project, "Studies on Rhizobium Biofertilizer for improvement of pulse production in Assam", sponsored by the Department of Biotechnology, Govt. of India. Isolation and screening of isolates was carried out in the laboratory and in the field. The following achievements have been made so far.

(a) Out of a total of 134 pure Rhizobium isolates obtained from 7 common pulses viz. Black gram, Green gram, Gram, pea, Lentil, Arhar and a local beam called urohi, collected from 6 districts Viz. Kamrup, Nalbari, Nagaon, sonitpur, Lakhimpur and Jorhat of Assam.
(b) Only 15 and 9 pure isolates of Rhizobium could produce nodeles when tested with agar and Sand tube method repectively of which only 6 strains were found resistant against a number of antibiotics tested.
(c) Screned isolates produced effective nodules for better root and shoot development, nitrogen content and crop yield when tested with Black gram and green gram both in pot and in field as kharif and Rabi crop.
(d) 3 strains of Rhizobia sjpwed wode host range ability over 6 pulses Viz. Black gram, Green gram, Cowpea, Groundnut, Soyvean and arhar with good nitrogenous activity and acid tolerance and produce significantly better yield when blended with compost and paddy straw.
(e) Selected strains have already been deposited to the DBT's culture Bank at Microbiology division, IARI-New Delhi.

PHYTOPATHOGENIC FUNGI:

A research project on "Survey collection and study of phytopathogenic fungi on cultivated crops of Assam", sponsored by the Assam Science, Technology and environment council, Govt. of Assam has been continuing and

(i) Isolation and identification of Pyricularia oryzoae and colletotrichum falcatum, the incitant of blast of rice and red rot of sugarcane respectively were done along with rating of their strains.

(ii) Physiological and biochemical aspects of the above strains have been studied in respect of physiology of growth in vitro and in vivo with different physical parameters and in respect of Biochemical aspect maceration of tissues, degradation of sugar, cellwal content profein content etc. along with fugal toxin extraction and purification for their effect on disease production both in vivo and in vitro.

(iii) Sources if ubicykyn abd biocontrol of the above diseases are continuing with progress. Species of trichoderma are using as biocontrol agents.

(iv) Survey and study of identification of disese prone and disease free seasons and zones of Assam for the above diseases have been continuing for future disease forcasting and crop planning in the state.

Research Publication :

1. Saikia, R.; Deka. A.; Kalita. R. & Azad P. (1997) : Studies on inhibitory effect of T. viride on some phytopathogenic fungi. ABS. Published in the symposium on Major Diseases of crop. Plants in Eastern India and their management organised by IPS at AAU. Jorhat.
2. Kalita.R.; M.Talukdar.P.Azad (1997) : Effect of the fungicide dithane M-45 on root tip cells of pisum sativa L New-Botanica Vol.15 No. (1+2).
3. Deka. A.;Kalita.R.; Saikia,R. & Azad.P. (1997) : Isolation of native strains of Rhizobia from Assam. National conference Publication on IBMHRD, No.74, J.U. Calcutta.

MEDICINAL AND ECONOMIC PLANTS:

The medicinal and Economic plants of North Eastern region are being used by different ethnic groups, communities since the long past in curing different diseases and to generate income for their livelihood. Amongst the various activities a data base of the traditional practices, remedies, magic healers, herbalists with their claims etc. for preservation and future utilization have been prepared. Already, this group has prepared a data-base of the folk practitioners of few villages of Kamrup District so far with their folk medicines. A detailed survey has been made in the villages where people of different ethnic groups were interacted to prepare this. Also, the patients treated were also interviewed and tried to authenticate the claims of the traditional practioners in the surveyed areas.

Few plants were collected from these surveyed areras which were claimed to be effective in curing liver diseases. These plants have been identified botanically by an experienced taxonomist and speciman samples have been preserved in our laboratory in the form of harbarirum sheets.

Experiments on these plants have been taken up in albino rats (Spraque Dawley) to determine the LD50 of these plants and also the effective dose of the various extracts of the plants. The plant-extracts have been studied on CCl4 - model, peracetamol and D-Galactosamiae models to ascertain the efficacy against Hepatic Disorder. We have also started working for the development of safe Birth Control herbal medicines. Scientists have started working on the claims of efficacy of the various preparations by the village practitioners on Birth control. Metals play a role in the Heart of a human being. The role of metal Mg in the Myo cardial infarction has been studied taking medicinal plants as a source of Mg to supplement for a person having history of such diseases. The activities are in progress.

Research Publication:

1. Investigation on the trace metal in the Clerodens: Kotoky, J. Abstract Published in the Indian Science Congress Association Annual Session, 3-8, Jan. 1997.

Participation in Seminars, Conferences etc.:

1. Dr. J. Kotoky, Asstt. Prof. Participated in the National Seminar on Natural Products, held at Calcutta University, 23-24th Sept. 1997.
2. Dr. J. Kotoky, Asstt. Prof. Participated in the National Workshop of projects on Couve Management, sponsored by DST, Govt. of India, at Wardha, Oct. 1997.
3. Dr. J. Kotoky, P.I. and Dr. P.N. Das, Co-investigator in the project, Div. Of Herbal Medinines with Sp. Ref. to Hepatic Disorder participated and presented their work in the group monitoring workshop of DST, Govt. of India, held at Madras from 5-7 Dec. 1997.

SERICULTURE :

Development of Muga culture with special reference to indoor rearing technique :

Demonstration cum training programmes on the indoor rearing technique of Muga silkworm were conducted thrice of Gandhya village near Jorhat town with the co-operation of a voluntary organisation, the Assam Agricultural and Village Industries Development Council, giving training two batches of trainees numbering fifteen each. The people of Gandhya and other nearly villages were so much convinced on the efficacy of the technique that they established a permanent training centre of their own at Gandhya village constructing a rearing house with the cooperation of the above noted voluntary organisation for imparting training to the willing Muga rearers and others on the technique. Morever, they formed a body selecting some Muga rearers and social workers of the Jorhat district as its member for the management of the centre. A two day meet of the Muga rearers of the District was also held at the initiative of the above noted body at Gandhya village to chalk out future plan of action . The training centre alongwith the rearing house as noted above was formally inaugurated by Dr. N.K. Choudhury, the former Vice-Chancellor of Gauhati University and the present Chairman of the IASST. It may be pointed out that the indoor rearing technique under reference made it possible for the first time to rear Muga silksorm indoors and it was innovated in the IASST.

For obvious reasons, the participation of woman was almost nil in the rearing programmes of Muga silkworm with the present process of outdoor rearing. On the other hand, the indoor process is more conducive for self engagement of women folk where mental and physical set up are very much suited to it as evident from their dominent role in the indoor rearing programmes of Eri and Mulbery silk worms. Adopting the indoor rearing technique significant contribution could have, therefore, been derived from them for the growth of Muga industry also utilising their ample leisure time. Happily the indoor rearing programmes arranged at Gandhya and earlier at Rani and Boko were actively participated by women folk. In fact, all the thirty trainers participated in the programmes arranged at Gandhya women though it is considered as taboo by the people of that village, as in some other villages, to see or handle Muga silkworm by women folk. Interestingly, all the women trained at Gandhya could see and handle the Muga silkworm for the first time in their life though other male members of the families of some of these trainees practised Muga rearing in their household garden. This unfounded belief was totally removed from the minds of the people of the locality when they saw the Muga rearing at Gandhya villages managed by the women trainees.

Eri :

The eri silkworm philosamia has been reported from the prehistoric period of time and was scattered in the dense forest of North Eastern region in wild condition. Gradually, it became a cottage industry of the tribal folk of this region. It produces wool like silk finish with a look of cotton and the softness of silk owing to a great market potential.

Seven ecoraces have been identified in their region so far. However, lack of information on the genetic differences amongst the races have become hindrance in the

breeding of their silkworm for quality silk. Use of genetic marker in silkworms breeding process has been well documented specially in mulberry silkworm. With this view in mind it is attempted to develop isozyme marker for this silkworm. Survey and collection of literature and sample (ecoraces) have been done. Six ecoraces have been collected so far and are being maintained in the laboratory. Analysis of amylase irozyme by PAGE method has been started. A small part plant garden of castor plant (Ricinas communsis) is being raised in the present IASST's campus. This work has been undertaken under the Project "Developing irozyme marker for different stocks of Eri silkworm" sponsored by Department of Biotechnology, Govt. of India and the work has been started from 1st of January'98.

RESOURCE MANAGEMENT AND ENVIRONMENT DIVISION :

Oil pollution has become a serious and wide spread problem all over the world. In India, specially North Eastern Region, where oil is produced, the problem is becoming serious, some time effecting even the cultivated land.

Hydrocarbons are present in small quantities in most soil and water. It is reported that hydrocarbons degrading microorganisms are distributed widly in nature where such compounds are present. But sudden increase of hydrocarbonaceous compounds into the natural ecosystem due to leakage or spillage, the local microflora may not be able to degrade them rapidly and this will be detrimental to the environment. Scientists have given emphasise to isolate petroleum eating microorganisms from crude oil contaminated ecosystem to control the oil pollution caused due to various activities of oil exploration. Keeping this view into consideration, a project on "Development of microbiological method(s) for control of hydrocarbonaceous pollutants in soil of Assam - a feasibility study" has been carried out in the RM & ED during the periods 1995 to 1997 and the project completion report has also been submitted to the DST, Govt. of India for taking necessary action. In this investigation five hydrocarbons degrading bacterial strains have been isolated from petroleum polluted oil field situated at Moran. The isolated microorganisms had been sent to the Institute of Microbial technology (IMTech) Chandigarh for characterization and identification. On the basis of these characterization, the isolated microorganisms have been identified as follows -

1. Pseudomonous aeruginosa
2. Pseudomonous stutzeri
3. Bacillus aneurinolyticus
4. Serratia marcescens
5. Azotobacter chroococcum

It is revealed from the investigation that P.stutzeri was found to be more effective amongst the isolates. Only A. Chroococcum shows ability to degrade hydrobarbons as well as atmospheric nitrogen, though they degrade petroleum hydrocarbons efficiently. All the above bacterial species except S. marcescens were present in the soil samples having neutral to slight alkalinity, while S. marcescens was present in soil sample having slightly acidic (PH6). It is possible to enhance the local microflora viz. Bacteria and Fungi in the test soil samples by using nitrogen and phosphorus containing fertilizer. As a result, this beneficial impact on degradation of petroleum hydrobarbons can best be utilized in natural condition in future.

Project proposal already submitted :

During the year 1997, a project proposal entitled "Studies on Azotobacter chroococcum present in oil polluted soil in Assam and its prospective to use as a biofertilizer for this region" was submitted to the DST Govt. of India, for financial assistance.

On going research activities :

1. Agropotentiality study on Jagiroad paper mill waste. This divisional research scheme was started during the year 1997. The following persons are associated with the scheme :

1. Dr. S.Deka	-	Supervisor
2. Dr. A. Devi	-	Research Associate
3. Mr. U. Medhi	-	Project Fellow

2. Physico-chemical properties and biodegradation study of refinery sludge. This is also a divisional research scheme in which the following research team is working :

1. Dr. S.Deka	-	Supervisor
2. Dr. A. Devi	-	Research Associate
3. Mr. P. Sharma	-	Project Fellow

Publications :

1. Agropotenciality of Jagiroad paper mill waste (solid). U.Medhi, A.Devi. S.Deka and N.K. Boissya. Abst. Ass. Sci. Soc. Tech. Ses. C-7, 1997.
2. Physico-chemical characterizarion of refinery sludge.P. Sharma, A.Devi, S.Deka and K.G. Bhattacharyya. Abst. Ass. Sci. Soc. Tech. Sec. C-8, 1997.

cipation in Seminar, Conference etc.

)r. S.Deka, Assistant Professor, attended in a seminar organised by DST, Govt. of ndia for the young scientists on the occasion of 85th annual session of Indian Science :ongress Association held on 3rd to 7th January, 1998 at Osmania University, Iyderabad and presented a paper on "Biotechnology in relation to control nvironmental pollution".

)r. S.Deka, Assistant professor, participated in a workshop on wetlands of Assam rganised by the Assam Science Society and WWF held on 7th October 1997, at 'lenetarium, Guwahati.

)r. A.Devi, participated in a workshop on UV - VIS - IR Spectroscopy - Modern nstrumentation and Applications organised by the DST, Govt. of India held from 11 - 3th Nov. 1997 atRegional Sophisticated Instrumentation Centre. Shillong.

)r. A. Devi, participated in a school on "Molecular Modelling of Materials")rganised by the Jawaharlal Nehru Centre for Advanced Scientific Research and the ndian Institute of Science, Banglore held from 12 - 16th Jan 1998 at IISc. Bangalore.

COMPUTER SCIENCE DIVISION :

Manpower Generation :

The Computer Science Division has been conducting the following Computer Courses - DOEACC 'A' Level course of 1 year duration (Implementing authority - DOEACC Society, New Delhi)

Post Graduate Diploma in Computer application of 1 year duration (Implementing authority - State Council of Technical Education, Assam)

Advanced Certificate Course (Implementing authority - IASST)

Special Courses / Training :

As in the previous year a special Advanced certificate course for 70 students belonging to different minority communities was conducted during Feb.'97 to July'97 on request and financial support from Assam State Minorities Board.

Consultancy Services :

The Computer Science Division has carried out data processing work for the project "Study of utilization and career profile of P.G.s and Ph.Ds in Science and Technology and the extent of R&D activities undertaken by Ph.Ds in higher educational Institutes in the NE Region" sponsored by Department of Science and Technology, Govt. of India and investigated by Prof. J. Medhi.

Academic Pursuit :

Shri B. Borah has successfully completed M.S. (System & Information) course of Birla Institute of Technology & Science, Pilani.

On Going Projects :

1. "Study of the Sheath Induced Non-linear Phenomena in Multi-component Plasma" Sponsored by the Department of Science and Technology, Govt. of India.

Research Group :

Dr. Joyanti Chutia	-	Principal Investigator
Dr. G.C. Das	-	Co-investigator
Dr. C.B. Dwivedi	-	-do-
Sri Arun Kumar Sarma	-	JRF

The project was completed on 31st March 1998 and the project report submitted.

2. "Development of Plasma Physics Division at IASST". Sponsored by the Department of Science and Technology, Govt. of India.

Research Group :

1. Dr. Joyanti Chutia	Principal Investigator
2. Dr. G.C. Das	Coinvestigator
3. Dr. A.R. Hazarika	Research Associate
4. Mr. Arun Kumar Sarma	-do-
5. Sri Bhagirath Handique	JRF
6. Sri Ramprokash Lavania	JRF
7. Ms. Barnali Sinha	JRF

3. Development of Mathematical Sciences at IASST. Sponsored by the Department of Science and Technology, Govt. of India.

Research Group :

Dr. A.K. Agarwal	-	Professor
Dr. K.K. Das	-	Assistant Professor
Dr. (Mrs) M.R. Agarwal	-	Assistant Professor
Ms. Barnali Dutta	-	JRF
Ms. Sangeeta Kalita	-	JRF

4. " Studies on utilisation and career profile of Post Graduate and Ph.D's in Science & Technology and to the extent of R & D activities undertaken by the Ph.D's in higher educational institution in the N.E. Region".

Sponsored by the Department of Science and Technology, Govt. of India.

Research Group :

Prof. J.Medhi	-	Principal Investigator
Sri D.N. Das	-	Chief Statistician
Sri M. Hzarika	-	Investigator
Sri S. Dey	-	- do -
Sri S. Baishya	-	Messenger

5. "Development of Herbal Medicine with special reference to Hepatic Disorder" sponsored by DST, Govt. of India.

Research Group :

1. Dr. J. Kotoky	-	Principal investigator
2. Dr. P.N. Das	-	Co-Investigator
3. Sri J.C. Gogoi	-	JRF
4. Sri D. Duwarah	-	JRF
5. Smt. R.L. Devi	-	Sr. Research Assistant
6. Sri N. Sharma	-	Sr. Research Assistant cum Animal Keeper

6. "Development of Muga culture with special reference to indoor rearing technique" Sponsored by DST, Govt. of India.

Research Group :

1. Dr. J.N. Talukdar	-	Principal Investigator
2. Sri S. Goswami	-	Laboratory Assistant
3. Sri T. Talukdar	-	-do-
4. Sri Balen Das	-	Field Helper.

7. Studies on Rhizobium Biofertilizer for improvement of pulse production in Assam sponsored by DST, Govt. of India.

Research Group :

1. Dr. P. Azad	-	Principal Investigator
2. Sri A. Kr. Deka	-	SRF
3. Sri R. Kalita	-	Jr. Research Assistant
4. Sri N. Dutta Lahkar	-	Field-cum-Laboratory Assistant

8. "Survey, collection and phytopathogenic fungi on cultivated crops of Assam" sponsored by ASTEC, Govt. of Assam.

Research Group :

1. Dr. P. Azad	-	Principal Investigator
2. Sri R. Saikia	-	JRF

9. Developing isozyme marker for different stocks of Eri Silkworm, sponsored by Department of Biotechnology, Govt. of India.

Research group :

1. Dr. (Mrs.) Dipali Devi	-	Principal Investigator
2. Dr. D.K. Sharma	-	Co. Investigator
3. Md. Sirajudding Talukdar	-	S.R.F.
4. Mr. Jayanta Deka	-	Field Assistant.

Project Proposal submitted :
The Golden hued Muga silk its pigmentation profile, submitted to DST, Govt. of India.

Consolidated Receipts & Payment Accounts of IASST for the year, 1997-98

Sl. No.	HEADS OF ACCOUNTS		Receipts	Payments
1.	Opening Balance		56,36,316.00	-
2.	Dev. of Maths. Div.		13,17,000.00	12,03,199.00
3.	Dev. of Plasma Div.		-	21,42,285.10
4.	Dev. of Herbal Medicine		4,50,000.00	4,37,212.00
5.	Dev. of Muga Culture		2,00,000.00	3,37,182.00
6.	Dev. of Eri Culture		2,18,000.00	1,59,605.00
7.	Career Profile		3,50,000.00	2,96,796.00
8.	Sheath Non-linear in Plasma		60,000.00	62,163.00
9.	Survey & Collection of Fungi		41,000.00	29,940.00
10.	Biofertilizer Project		-	98,688.00
11.	Micro-method Project		-	2,345.00
12.	Seed Money Project		-	1,594.00
13.	Education		3,99,600.00	2,14,042.00
14.	Land & Buildings		9,99,500.00	-
15	General Office Management etc.		-	33,04,067.64
16.	IASST General		18,51,139.00	7,58,068.35
17.	Reserve Fund	6,00,000.00	-	1,06,000.00
	Reserve Fund New	1,06,000.00		
		7,06,000.00		
18.	Closing Balance		-	23,69,967.91
	Total	Rs.	1,15,23,155.00	Rs.1,15,23,155.00