ANNUAL REPORT

April 2003-March 2004

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY

GARCHUK, BORAGAON, GUWAHATI - 781 035

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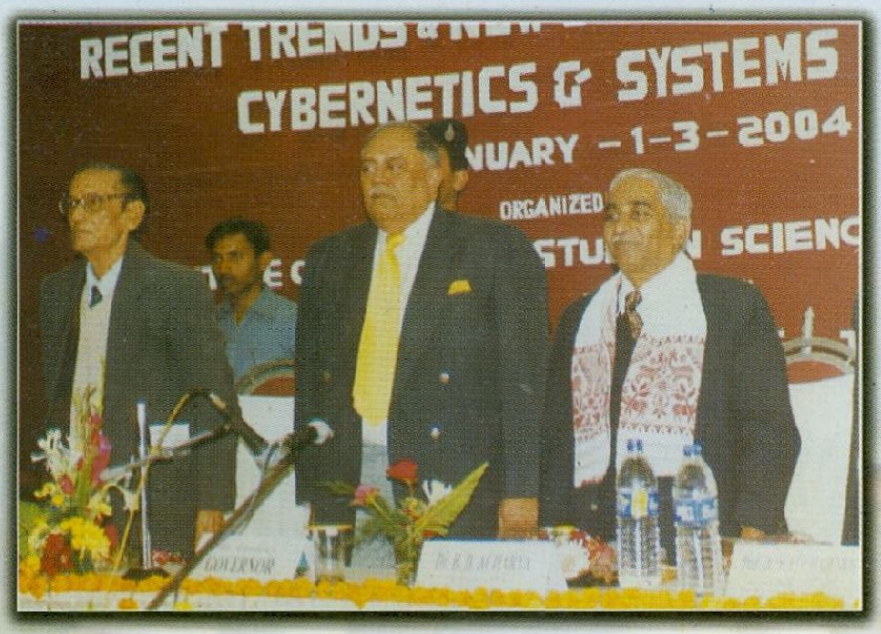
Institute of Advanced Study in Science and Technology
Paschim Boragaon, Garchuk, Guwahati - 35, Assam



Hon'ble Governor of Assam Lt. Gen. Ajai Singh with eminent Scientists attending International Seminar on recent trends and new directions of research in cybernetics & systems thory.

Prof. N.N. Dass, Director, IASST and Prof. D. Duttamazumder, ISI, Kolkata attending a pressmeet.

Sri J.P. Rajkhowa, Chief Secretary, Govt. of Assam, Mrs. T.Y. Das, Commissioner & Secretary, DST, Govt. of Assam in a meeting with the Director, IASST and academic staff of the IASST.

Sri Sarat Borkotoky, Hon'ble PWD Minister, Govt. of Assam and Sri Homen Borgohain, noted litterateur and journalist at the permanent campus of the IASST.

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Foreword

We are now moving to our new campus at Paschim Boragaon, Garchuk, Guwahati 781035. The Government of Assam has allotted to the Institute of Advanced Study in Science and Technology, (IASST) a plot of land measuring 20 acres at Pachim Boragaon in Greater Guwahati to set up its Complex. The DST, Govt. of India, was kind enough to sanction in 1998 a sum of Rs. 9.55 crores under the scheme 'Upgrading the IASST' in order to generate infrastructure for research including laboratories, buildings, sophisticated equipment etc. Out of the sanctioned fund, an amount of Rs. 6.50 Crore has been earmarked for building and other components. Various organizations are also supporting us through various projects. We are really grateful to them for the financial support.

There is an encouraging news for the scientific community of the North-East region that the IASST would be taken over as affiliated institute by the Central Government, thanks to the Assam Accord. So we are seeing the light at the end of the tunnel.

The road connecting the NH 37 to the Institute (1.6km) is already developed by P.W.D. Govt. Assam.

Now that we have our OWN HOME at Paschim Boragaon, Guwahati 781035, we are to work hard to raise the standard of the IASST to the National Level. To raise it to that level, hard working must be coupled with planning, exposure, interaction, vision, will power and creativity of the scientific community.

There is no substitute for hard working. Broadly speaking there are three types of workers (1) work alcoholics, (2) dedicated workers and (3) non-performers. Every organization looks for the best workers and nobody looks for the non-performers. Tenacity of purpose is characteristic of hard workers.

One should work to plan to achieve the goal since haphazard work leads to nowhere. Planned scheme leads to success and nothing succeeds like success.

No one can work in isolation in the competitive world. Inter institutional interaction brings wonderful results. In India, it is necessary because we have scientific expertise in different fields. Besides, in India, it is necessary because we have costly equipments and instruments worthing crores of rupees in different laboratories.

Most of the IASST's research workers are supported by substantive grants from DST, DBT, MIT, OIL, MOEF, ICAR, DAE etc. We have a strong base for doing creative research. We must strive hard for innovation of a high order intellectual property rights dispute proof effective solutions to the problems of India in general and North-East region in particular through individual as well as collective effort. We organized an International Conference (1st –3rd January 2004) and a National Workshop (January 28- February 1, 2004) successfully. It was possible only due to the teamwork of academic, administrative, scientific, library and other staff members.

I am really grateful to the Chairman and the Council members for their timely advice. We hope under their leadership the IASST will become National Institute soon.

Prof. N.N. Dass
Director, IASST

31/ 3/ 2004

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INSTITUTE OF ADVANCED STUDY IN SCIENCE & TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI - 35

<http://www.iasst.res.in>

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2. DIVISIONS OF THE IASST

2.1 MATERIAL SCIENCES DIVISION

Faculty

Name:	Field of interest
Dr. J. Chutia, Professor & Head	Plasma Physics
Dr. H. Bailung, Associate Professor	Plasma Physics (Experimental)
Dr. N.S. Sarma Assistant Professor	Polymer Science
Dr. N.N. Dass, Director	Polymer Science

Material Sciences Division:

Presently it has two units;

i. Plasma Physics
ii. Polymer Science.

i. Plasma Physics unit

The plasma physics group is carrying out research works both in experimental and theoretical plasma physics.

The topics of Research in Plasma Physics Unit are as follows:

- Waves and Instabilities in plasma
- Sheath phenomena
- Microwave reflectometry measurement
- Basic plasma processing

Influence of electron beam injection on plasma parameters and sheath in a dc discharge plasma:

Influence of an electron beam on plasma characteristics and boundary sheath has been investigated experimentally in dc discharge plasma. The electron beam is produced by biasing the Source section negatively at potential V_s with respect to the grounded Target section of a Double plasma device. The electron density is found to increase with increasing beam energies (Fig.1). This is due to enhanced ionization by the beam electrons in the target section. The measured beam density n_b is also shown in Fig.1 and is found to increase initially with increasing V_s ($V_s \leq$ -20V), and decreases when V_s is made more negative. The maximum beam density in the present discharge condition is ~ 1.5% of n_e when V_s~-20V and reduces to ~0.3% when V_s is increased to -50V. At higher beam energies the beam density decreases due to conservation of electron beam flux from source to target, since the source plasma density is kept constant throughout the experiment. Another reason for a smaller percentage of beam density at higher V_s is the increase in the background plasma density caused by enhanced ionization in the target plasma by the beam electrons. The plasma potential measured by the emissive probe in the bulk plasma region i.e., far away from the sheath of the plate is also shown in Fig.1. The target plasma potential is nearly zero, when there is no electron beam and it is found to decrease by 2 volts or so when V_s is varied from 0 to -50 V as shown in Fig.1.

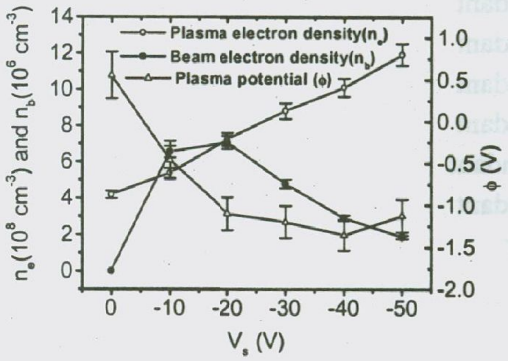


FIG. 1. Measured variation of plasma electron density n_e and beam electron density n_b with source bias voltages V_s. The plasma potential ϕ_p measured by the emissive probe at different V_s are also shown.

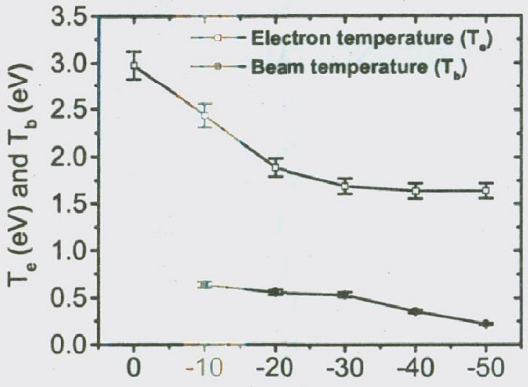


FIG. 2. Measured electron temperature T_e and beam temperature T_b at different source bias voltages V_s.

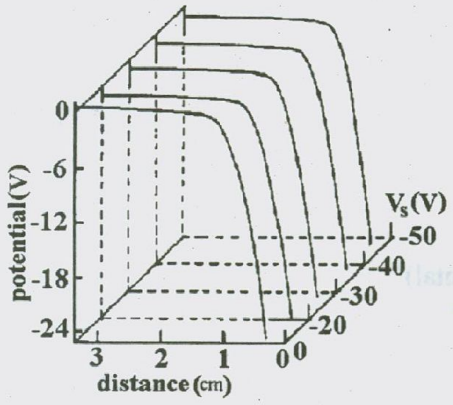


FIG. 3. Axial potential profiles in front of the stainless steel plate measured by the emissive probe at different source biasing voltages V_s. Plate bias is fixed at –100V. Zero in the distance axis represents the position of the plate.

Measured beam temperature is found to be much smaller than the plasma electron temperature bj (Fig.2). It is observed that both the electron temperature and the beam temperature in the target plasma decrease slightly with the increase of electron beam energy.

The measured variation of the sheath thickness d measured from the potential profiles presented in Fig.3 and the ion saturation current I_{is} at the plate with the source bias voltage V_s are shown in Fig.4. It is found that the sheath thickness slightly decreases when electron beam (E_b = 10 ~ 50eV) is flowing toward the plate. Increase of ion saturation current at the plate is also observed when the electron beam is present. The increase of ion saturation current at the plate and the sheath contraction may be attributed to the increase of plasma density.

At the floating potential, the net current collected by the probe is zero i.e. $I_e + I_b = I_i$. In absence of electron beam, the measured floating potential of the probe is ~-22V and becomes minimum (~-28V) when E_b ~ 30eV (Fig.4). With further increase of E_b, however ϕ_f increases. This is due to the fact that in the present discharge condition, beam density increment is prominent only up to E_b <30eV (Fig.1). The measured beam density in this experiment is maximum (1.5% of n_e) for E_b ~ 20eV. With further increase of E_b, the beam density decreases in order to conserve

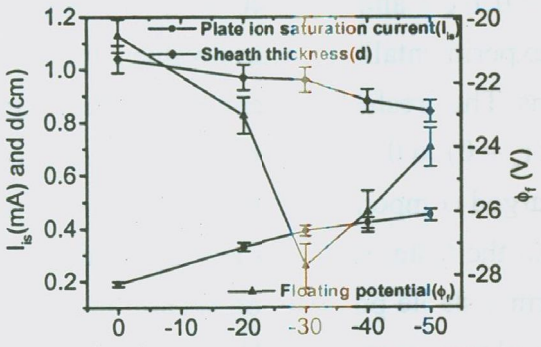


FIG. 4. Dependence of ion saturation current I_{is} and floating potential ϕ_f at the plate with source bias V_s. Measured sheath thickness d versus V_s when the plate bias is fixed at –100V are also shown.

the beam electron flux. On the other hand, the beam to thermal electron density ratio i.e n_b/n_e reduces to a much lower value (~ < 0.003) when E_b > 30eV due to the increase in bulk plasma density. It is evident from this experiment that the ion saturation current to the plate increases due to the increase in plasma density even for E_b> 30eV, though the beam flux tends to saturate. Therefore, the beam current increment is smaller in comparison to ion saturation current increment at the plate for higher E_b and hence, the control over the lowering of floating potential is limited to the beam energy range of 20 – 30eV. In this experiment, however, the ratio of beam to thermal electron density reduces to a much smaller value (~0.003) when E_b ~30eV which limits further lowering of ϕ_f beyond –28V (Fig.4). By changing the discharge current, the electron beam density and consequently the floating potential of the plate can be controlled. One important application of this method is that the floating potential of an insulating surface can be controlled by this method.

Study of Pre-sheath in electro-negative plasma:

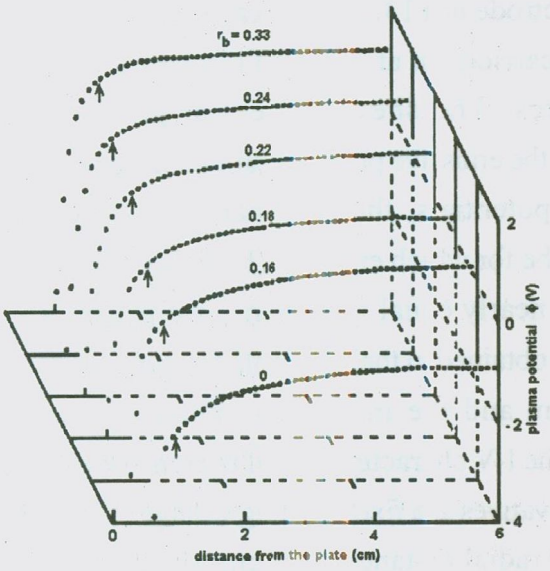


FIG 5. Measured axial plasma potential profiles in front of the metal plate for different negative ion density ratio r_b. The plate biasing voltage is Vp = -100 V. The sheath edge is shown by the arrow mark. Zero on the distance axis is the plate position.

Properties of pre-sheath formed in front of the sheath of a negatively biased plate are investigated in electro-negative plasmas. Plasma is produced by dc filament discharge technique having surface magnetic confinement. In this experiment, the decrement in pre-sheath potential drop as well as positive ion drift velocity at the sheath edge is experimentally recorded in presence of negative ions. The positive ion drift velocity at the sheath edge is calculated from the measured pre-sheath potential drop. The plasma potential takes more positive values with the increase of negative ion concentration.

It is observed that the plasma potential in the bulk plasma increases with increasing r_b (-0.80 V when r_b = 0 to +1.25 V when r_b = 0.33). The plasma manifests its potential in such a way that the loss rates of the negative and positive charges are equal so that the plasma quasi-neutrality condition is maintained. The presheath potential drop is measured from the potential profile curves (shown in Fig. 5), which show a gradual plasma potential decrease up to the sheath edge and a sharp fall of potential from the sheath edge to the plate surface i.e within the sheath. In Fig. 5 potential values above -4.0 V are plotted to show the presheath potential clearly. Arrows in Fig. 5, mark the location of the sheath edge in the potential profile curves. The difference of potential at bulk plasma and sheath edge gives the presheath potential drop (ϕ_{pre}). The drift velocity of the positive ions u_d is estimated from the relation

$$u_d = \left[2e\left(\phi_{pre} + T_+\right)/m_+\right]^{1/2}$$

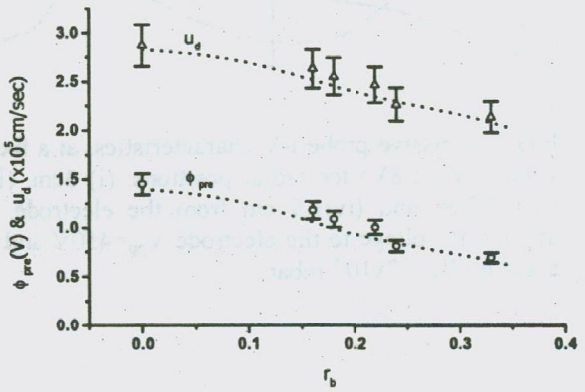


FIG 6. Measured presheath potential drop ϕ_{pre} (open circle) and positive ion drift velocity u_d (open triangle) at different negative ion density ratio r_b. The theoretical curves (dotted curves) for ϕ_{pre} and u_d calculated using the experimental parameters are also shown.

where m_+ is the mass of the positive ions. In this experiment $T_+ = 0.1$ eV and $m_+ = 40$ amu (for Argon). Theoretical curves for ϕ_{pre} and u_d are shown in Fig.6 along with the experimentally measured values. It is seen that experimental results nearly agree with the theoretical calculations. The presheath potential drop decreases with negative ion concentration from its maximum value 1.68 V (at $r_b = 0$) to 0.72 V (at $r_b = 0.33$). In plasma containing negative ions, the effective temperature of negatively charged components is found to be less than that of the simple two-component plasma. This is due to the fact that the faster electrons are replaced by the massive negative ions. The required presheath potential drop to form a stable positive ion sheath, decreases when the effective temperature of the negative charge components in plasma is reduced. The positive ion drift velocity decreases with increasing negative ion concentration as shown in Fig. 6. Since the accelerating potential (ϕ_{pre}) for the positive ions to the sheath decreases with r_b, the drift velocity of positive ions (u_d) decreases. On the other hand, it is clearly seen that the sheath thickness (as measured from the plate surface to the sheath edge) increases with increasing negative ion concentration.

Investigation of sheath phenomena in a capacitive rf plasma :

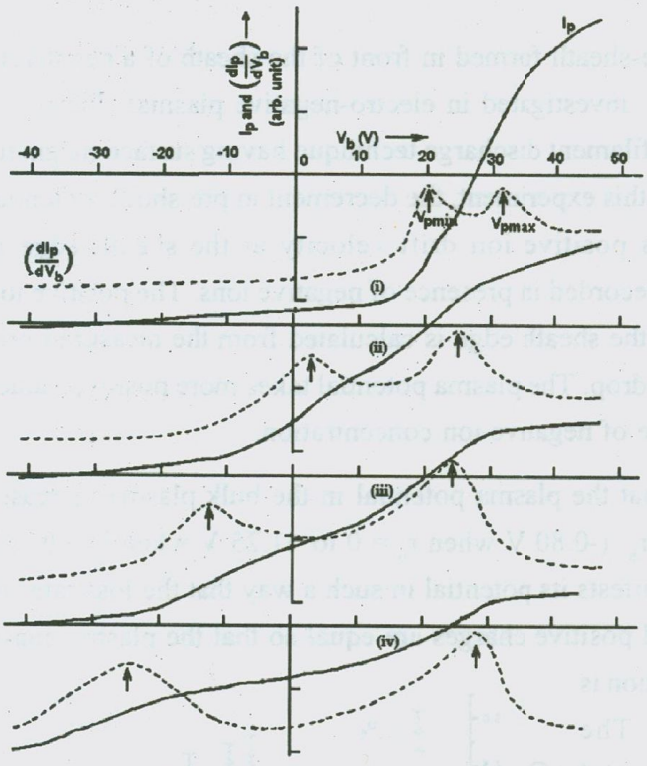


FIG.7. Emissive probe I-V characteristics, at a fixed heating voltage(V_h=1.8V) for radial positions: (i) 3cm, (ii) 2.6 cm, (iii) 2.2cm and (iv)1.9 cm from the electrode. Here, the applied rf voltage to the electrode V_{pp}=450V and the Argon pressure P_{Ar}= 7x10^{-4} mbar.

An experimental study of rf sheath formed on the powered electrode in a 13.56 MHz capacitive discharge of Argon is carried out at different discharge voltages and pressures. The sheath potential profiles are measured by the emissive probe technique. To determine the plasma potentials, the I-V characteristic of the emissive probe for which emission(I_e) and collection(I_c) currents are nearly equal is chosen. Two peaks, V_{pmin} and V_{pmax} are obtained in the differentiated curve indicate the minimum and the maximum values of plasma potentials. The I-V characteristics of the emissive probe and their derivatives at a fixed heating voltage (V_h=1.8V) for different radial distances (i) 3cm, (ii) 2.6cm, (iii) 2.2cm and (iv) 1.9 cm are shown in the Fig.7; here the applied rf voltage to the electrode V_{pp}=450V and the Argon pressure P_{Ar}=7x10^{-4} mbar. When one approaches towards the live electrode inside the sheath region, V_{pmin} decreases rapidly, but V_{pmax} decreases slowly at first and then increases. The time average value of the plasma potential at any position is estimated by taking the mean value of V_{pmin} and V_{pmax}, considering the time variation of the plasma potential is sinusoidal.

The radial potential profiles of the minimum(V_{pmin}), maximum(V_{pmax}) and time average(V_{pav}) potentials using the emissive probe in front of the electrode E at V_{pp}=300V and P_{Ar}=7x10^{-4}mbar are shown in the Fig.8. The zero of the distance axis is at the position of the electrode surface. Far away from the plate the straight portion of the profiles represent the potentials of the bulk plasma. Towards the electrode, the potentials of V_{pmin} and V_{pav}

suffer a rapid fall, which indicate the plasma sheath boundary. But the profile of V_{pmax} decreases slowly at first and then increases. From the potential profiles of V_{pmin} and V_{pav}, the maximum and the time average sheath thickness are determined by taking their semilog plot and drawing tangents in the rapid fall region. The arrow marks indicate the sheath edge positions. The time average sheath thickness (d) obtained from the potential profiles versus applied rf voltages are presented in fig.9 by open triangles at different pressures. In dc plasma the sheath thickness can be determined from the well-known Child's Law:

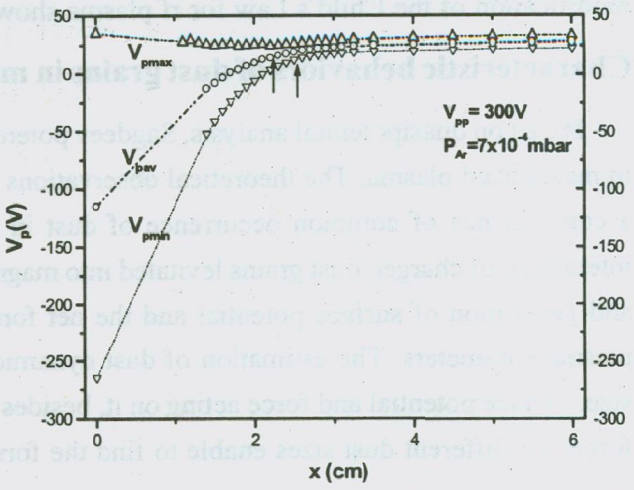


FIG.8. The maximum(V_{pmax}), the minimum(V_{pmin}) and the average(V_{pav}) value of radial plasma potential profiles measured by emissive probe. x is the distance from the electrode surface. The arrow marks indicate the sheath edge. Here $V_{pav} = (V_{pmax} + V_{pmin})/2$.

$$d = K\left[\varepsilon_0\left(\frac{2e}{m_+}\right)^{1/2} V^{3/2}\frac{1}{J_i}\right]^{1/2} \quad (1)$$

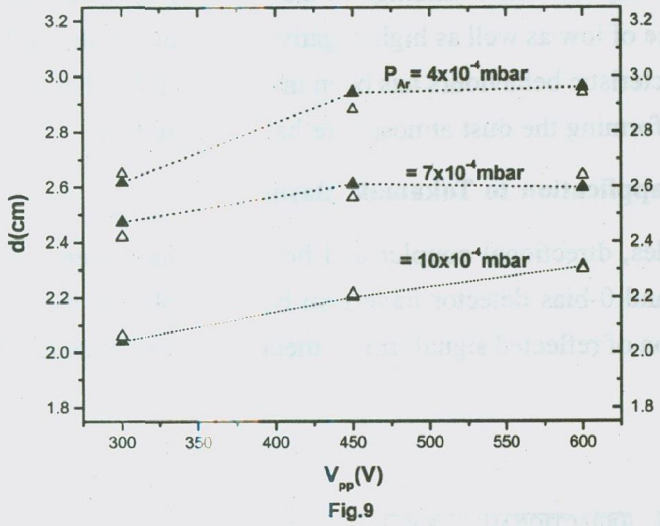


Fig.9

FIG.9: The time average sheath thickness (d) with applied rf voltages (V_{pp}). The open triangles represent the measured value and the solid triangles connected by dotted lines represent the calculated value of the sheath thickness.

where K=[4/9]$^{1/2}$. Lieberman shows that for time average sheath thickness in rf plasma the Child's Law is also applicable, but in this case K=3.04. The calculated values of sheath thickness d using the above equation putting the measured data for V(= V_{pav} - V_{dc}) and J_i are shown in figure (9) by the solid triangles connected by the dotted lines. We found that for K=3.2, the calculated sheath thickness shows best fitting with the measured values. This value of K is nearer to the theoretically predicted value of time average sheath thickness in rf plasma by Lieberman. From Fig.9 we see that the time average sheath thickness decreases with the increase of pressure at a fixed discharge voltage. With the increase of pressure (V_{pav} - V_{dc}) remains almost fixed but the plasma density and hence the ion current density at the electrode increase which reduce the sheath thickness. At fixed pressure, with the increase of the discharge voltage the time average sheath thickness depends on ion current density J_i and the magnitude of the self V_{dc}, since both of these increase with V_{pp}.

For the investigation of the sheath properties in rf plasma, the emissive probe technique is very useful. Though in low pressure rf plasma the displacement current covers the major parts of the total current, the ion (conduction) current is responsible for the time average sheath thickness. With the increase of gas pressure, the ratio of conduction to displacement current density increases. The sheath thickness decreases with the increase of pressure because of the enhancement of the plasma density. For the estimation of the time average sheath thickness the Lieberman's

modification of the Child's Law for rf plasma shows very good approximation.

Characteristic behaviors of dust grains in magnetized plasma sheath:

Based on quasipotential analysis, Sagdeev potential equation has been derived to study the sheath characteristics in magnetized plasma. The theoretical observations have been made to know the new features of sheath region. As a consequence of common occurrence of dust in every plasma environment, our motivation is to estimate the interaction of charged dust grains levitated into magnetized plasma sheath. We have calculated the size of dust grain, and generation of surface potential and the net forces acting on it inside the sheath, for some chosen laboratory plasma parameters. The estimation of dust dynamics in sheath expects to be controlled by its self-properties like size, surface potential and force acting on it, besides the ambient plasma properties. The over all observations of the forces on different dust sizes enable to find the formation of dust atmosphere.

Characteristic behaviour of dust grains in sheath formed in plasma with negative ions:

The motivation of the work is to study the formation of sheath in plasma contaminated with additional negative ions. The sheath formation has been analysed through the solution of Sagdeev potential equation derived in plasma by using the pseudopotential method. Because of the negative ions, it has shown that the sheath formation, in contrast to simple plasma, faces difficulty. It introduces a potential barrier from which modes are reflected and the potential variation beyond it is of complex, which, in turns, show new findings. It also reveals that the potential variation should be estimated in plasma sheath in presence of low as well as high negative ion-concentrations. Later the levitation of a dust grain into the sheath and its characteristic behaviours has been investigated. Further the dust size in the ideal plasma sheath along with the causes of forming the dust atmosphere has been studied.

Fabrication of microwave reflectometry system for application to Tokamak plasma:

The Ka-band microwave components eg. wave guides, directional coupler and horn antennas assembled for testing. The 26 – 28 GHz, 10db microwave generator and 0-bias detector have also been coupled to the testing arrangement. Microwave signal transmission and detection of reflected signal from a metal reflecting plate has been performed using Lecroy DSO.

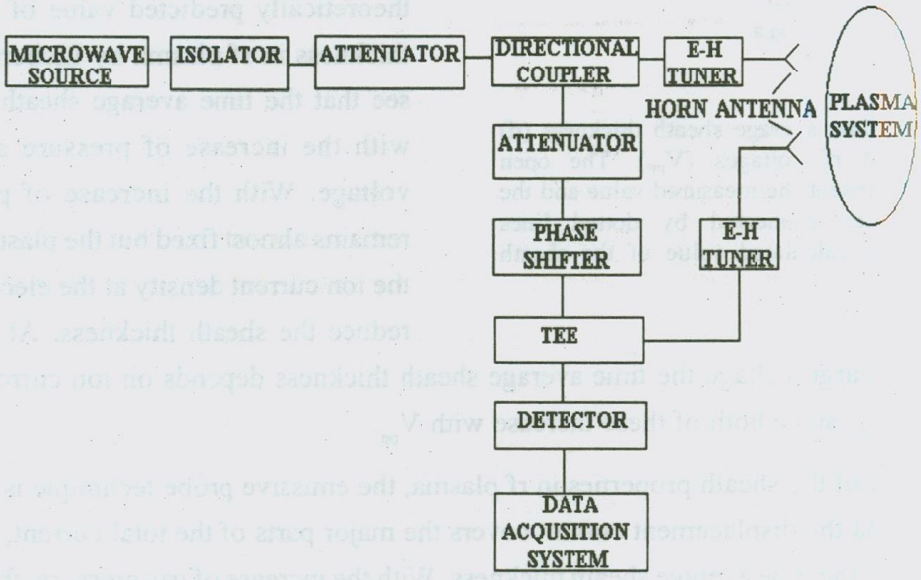


FIG. 10:Schematic Diagram of the Experimental setup of the Microwave Reflectometry System

Design and development of Instruments :

A high voltage power supply of 2000Volt /1 Amp is indigenously made by plasma physics group. The complete specification of the power supply unit is given below:

Specification:

INPUT VOLTAGE : 230Volt AC +/- 10%, 50 Hz Single Phase

OUTPUT VOLTAGE : 40 – 1800 Volt DC at present setting but , it can be achieved up to 2000 Volt (max.).

CURRENT CAPACITY : 1Amp.

RIPPLE & NOISE : ~ 0.5 % (r. m. s.)

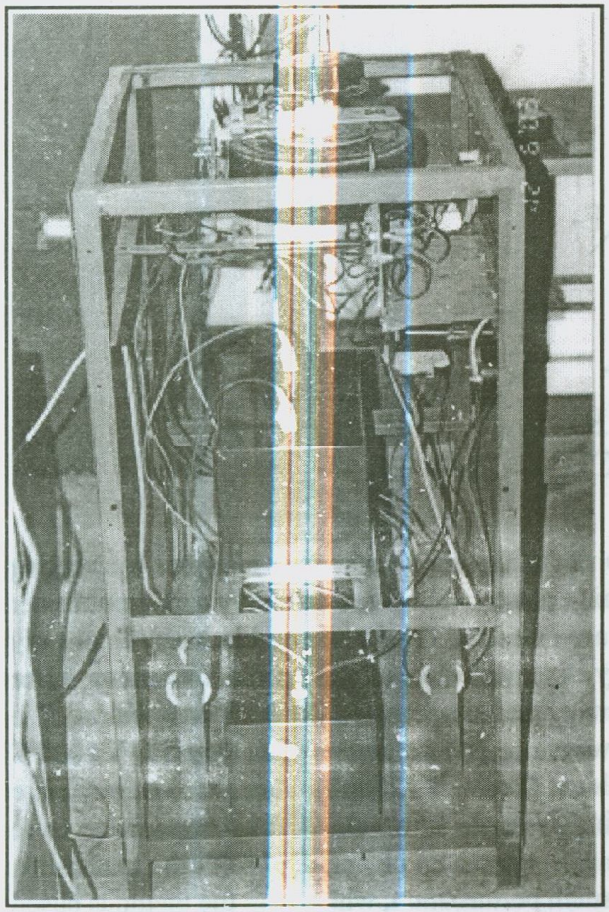
METERING :

- Voltmeter (V_1) 1800 Volt
- Voltmeter (V_2) 1200 Volt
- Ammeter (A_1) 1.9999 Amp (Digital)

DIMENSIONS: 43cm X 56cm X 80cm.

Description :

The scheme contains two transformers, one is the Variac (variable transformer) that is directly connected to the line with one toggle ON/OFF switch and the other is a step up transformer connected after the Variac. There are two neon indicators, Green and Red to indicate the power ON/OFF in the unit. A 10Amp fuse is used for the short circuit and overload protection. In the input section of the transformer there is a resistance- capacitance (R, C) combination filter to diminish the effect of high frequency component present in the mains 230V AC. The knob fitted with the Variac controls the voltage feed into the step-up transformer. A bridge rectifier containing four metal diodes having capacity up to 2000Volt/4 Amp is used to rectify secondary voltage of the transformer. The rectified output is then fed to a filter circuit. Filter circuit consists of two electrolytic capacitors connected in a parallel combination and each of those having the value of 170μfd/2.5kV. Output is taken through a resistance by a co-axial cable. This resistance is used to match the impedance of the system. There are two voltmeters to measure the voltage applied to the load without and across resistance respectively.



ii. Polymer Science unit

In polymer science unit efforts are being made to develop flow improver, viscosity index improver, ionics, adhesives, polymer foams and liquid crystalline polymers.

The research activities so far carried out are:

- Ionic properties of poly 2-vinyl pyridine (P-2VP) and its halides are investigated.
- Efforts are on to prepare polyacrylates from polyvinyl alcohol to be used as flow improver.
- Work is going on to develop suitable polymer foam of density ranging from 5mg/cm^3 to 200mg/cm^3 for laser fusion experiments. The foams will be useful in connection with inertial confinement fusion (ICF).

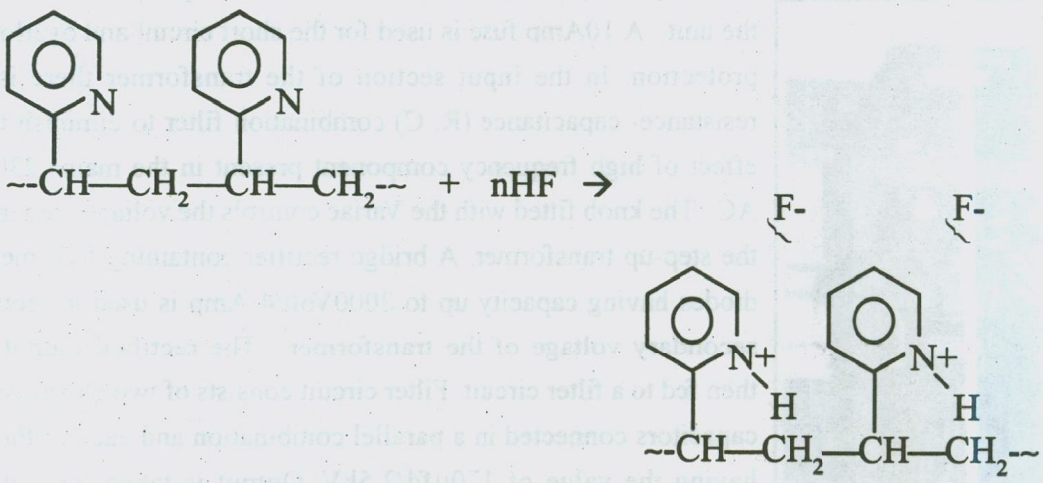
Synthesis and ionic conductivity measurement of Poly-2-vinyl pyridine and its HF salt:

Work has been done to synthesize HF salt of Poly-2-vinyl pyridine, characterization and the conductivity measurement of the same in Solid State.

Preparation of P-2VP: The purified distilled monomer 2VP was polymerised thermally in vacuum at 60°C for 24 hours. The polymer P-2VP so formed was dissolved in benzene and then precipitated in water. The product so obtained was dried in an oven at 60°C for 12 hours and stored over P_2O_5.

Preparation of P-2VP-HF: A concentrated solution of P-2VP in benzene was treated with 10% hydrofluoric acid at room temperature and kept for overnight. P-2VP-HF was then precipitate in acetone. The P-2VP-HF so formed was dissolved in water and double precipitation was done to get purified salt. It was then stored over P_2O_5 before use.

It is assumed that the reaction proceeds in the following way.



Ionic conductivity of the material was determined with the help of a frequency response analyser by applying frequency ranging from 1Hz to 100kHz. The measurements of ionic conductivities are normally carried out under AC conditions because under this condition polarization effects are avoided. The ionic conductivity is not only charge transport but also mass transport and hence conductivity is a function of the applied frequency. Here impedance and phase angle are measured as a function of frequency and temperature for each composition. The data is to be subsequently displayed and analyzed in two standard ways i.e., (i) Arrhenius plots (log σT) Vs 1000/T where linear regions are identified and (ii) complex impedance plots (Zcosθ Vs ZSinθ) where arcs of circles are fitted. From the arcs R_{dc} or Bulk resistance of the corresponding sample is obtained. The impedance is the proportionality factor between potential and current. Electrochemical system can be studied with the methods on impedance measurements. The methods involve the application of small perturbation, whereas in the methods based on linear sweep or potential step the system is perturbed far from the equilibrium. This small-imposed perturbation can be applied potential, of applied current or with hydrodynamic electrodes, of convention rate. The response to the applied perturbation, which is generally sinusoidal, can differ in phase and amplitude from the applied signal.

This electrical conductivity is subsequently obtained from the relation

$$\sigma = \frac{t}{R_b.A} \qquad (1)$$

where t = Thickness of the pellets
A = Area of the sample to be measured
R_b = Bulk resistance

The total ionic transport number, t_{ion} will be evaluated by the standard Wagner polarization technique. The cell SS|P-2VP-HI|SS (SS stands for Stainless Steel) is to be polarized by a step potential (about 1.0 V) and the resulting potentiostatic current will be monitored as a function of time. The stainless steel acts as blocking electrodes for the above cell. The formula for the evaluation of t_{ion} is:

$$t_{ion} = (i_T - i_e) / i_e$$

where i_T and i_e are total and residual current respectively.

Ionic conductivities of natural silk, cotton and its comparison with synthetic one :

The ionic conduction data and nature of the some of the well known silk like Muga and Tasar were compared with cotton and synthetic cloth in this work. The ionic conductivity of different types of Muga was also compared. The material was placed in between two stainless steel plates used as electrodes and the conductivity was determined from 30 to 100°C. The data showed that they are more conducting than the synthetic fibres and thus they are more comfortable along with other quality like course texture, thermal and UV properties. The ionic conductivity of fine Muga is ranging from 9.866×10^{-11} Scm^{-1} at 30°C to 4.673×10^{-10} Scm^{-1} at 100°C. The conductivity was determined under a relative humidity of 57%. The IR spectra of these materials were also compared.

From the study it is observed that with the help of ionic conduction measurement it is possible to assess the quality of the fabrics and a high conduction is related with the comfort of the user. The high conduction of our age long fabrics lessens the chances of accumulation of static charge formed due to rubbing with the skin of our body and is more comfortable than the synthetic one.

2.2 MATHEMATICAL SCIENCES DIVISION:

Faculty

Name	Field of interest
Dr. G. C. Das Professor	Applied Mathematics
Dr. B.C. Tripathy Associate Professor & Head	Pure Mathematics
Dr. G. Choudhury Asstt. Professor	Statistics

Mathematical Sciences Division was started in 1993 under a major project from the DST, GoI.

Presently the Division has, however, been maintained by the Institute itself since April 2001.

The Division has been pursuing research works on the areas of soliton dynamics, Levitation of dust grains into the sheath formation in the sheath, Queueing Network and Communication system, distribution theory, Application of Functional Analysis Techniques for studies in sequence spaces, Harmonic Analysis, Function Theory, Summability Theory and Fuzzy Set Theory.

Work Done on Pure Mathematics (Sequence Spaces and Summabilitry Theory).

The work done on pure mathematics at IASST is lead by Dr. B. C. Tripathy. Some of the investigations have been done in collaboration with Professor Mikail ET and Professor Y. Altin of Firat University TURKEY. Some of the investigations done with Professor T. Salat and Professor M. Ziman of Comenius University; SLOVAKIA have been accepted for publication. A part of the work has been done with the research fellows Ms. Mausumi Sen and Ms. Sabita Mahanta.

(*a*) Generalized Difference Sequence Spaces Defined by Orlicz Function in a Locally Convex Space.

Let M be an Orlicz function, X be a locally convex Hausdorff topological linear space, whose topology is determined by a set Q of continuous seminorms q and $p = (p_k)$ be a sequence of positive real numbers. Let $w(X)$ denote the space of all sequences defined over X and m be a non-negative integer. We define the following sequence spaces

$$W(\Delta^m, M, p, q) = \{x \in w(X) : \frac{1}{n}\sum_{k=1}^{n}\left[M\left(q\left(\frac{\Delta^m x_k - L}{\rho}\right)\right)\right]^{p_k} \to 0 \text{ , as } n \to \infty, \text{ for some } \rho>0 \text{ and } L\}$$

$$W_\infty(\Delta^m, M, p, q) = \{x \in w(X) : \sup_n \frac{1}{n}\sum_{k=1}^{n}\left[M\left(q\left(\frac{\Delta^m x_k}{\rho}\right)\right)\right]^{p_k} < \infty \text{ , as } n \to \infty, \text{ for some } \rho>0\},$$

where $\Delta^m x_k = \Delta^{m-1}x_k - \Delta^{m-1}x_{k-1}$, $\Delta^0 x_k = x_k$, for all $k \in N$.

For $L = 0$, we write $W(\Delta^m, M, p, q)$ as $W_0(\Delta^m, M, p, q)$. It is shown that for $p = (p_k)$ a bounded sequence of non-negative real numbers, the above are paranormed spaces, paranormed by

$$g_\Delta(x) = \inf\left\{\rho^{\frac{p_n}{H}} : \sup_{k\geq 1} M\left(q\left(\frac{\Delta^m x_k}{\rho}\right)\right) \leq 1, \rho > 0, n \in N\right\}, \text{ where } H = \max\{1, \sup p_k\}.$$

A sequence (x_k) is said to be Δ_q^m-statistically convergent to L, if for a given $\varepsilon>0$,

$$\lim_{n\to\infty} n^{-1} Card\{k \leq n : q(\Delta^m x_k - L) \geq \varepsilon\} = 0.$$

We denote the class of all Δ_q^m-statistically convergent sequences by $S(\Delta_q^m)$.

Different topological and algebraic properties of the spaces $W_\infty(\Delta^m, M, p, q)$, $W(\Delta^m, M, p, q)$ and $W_0(\Delta^m, M, p, q)$ are studied. Some inclusion results are obtained involving these spaces. Necessary and sufficient conditions are obtained for the equalities of the inclusions. It is shown that the space $S(\Delta_q^m) \cap \ell_\infty(\Delta_q^m)$ may be represented as the space $W(\Delta^m, M, q) \cap \ell_\infty(\Delta_q^m)$.

These investigations are done in collaborations with Professor Mikail ET and Professor Y. Altin of Firat University TURKEY.

(*b*)Vector Valued Sequence Spaces Associated with Multiplier Sequences.

Let E_k be seminormed spaces, seminormed by fk, for each k $\in N$. Let $\Lambda=(\lambda_k)$ be an associated multiplier sequence of non-zero complex numbers and $p = (p_k)$ be a sequence of positive real numbers. We define the following vector valued sequence spaces associated with Λ :

$$\ell_\infty\{E_k,\Lambda,p\} = \{(x_k) : x_k \in E_k \text{ for all } k\in N \text{ and } \exists\ r>0 \text{ such that } \sup_k \left(f_k(r\lambda_k x_k)\right)^{p_k} t_k < \infty\}$$

$$c_0\{E_k,\Lambda,p\} = \{(x_k) : x_k \in E_k \text{ for all } k\in N \text{ and } \exists\ r>0 \text{ such that } \lim_{k\to\infty} p\left(f_k(r\lambda_k x_k)\right)^{p_k} t_k = 0\},$$

where $t_k = p_k^{-1}$ for all $k\in N$.

It is shown that for all non-negative sequences $p = (p_k)$, the above spaces are linear spaces. Their completeness is established. It is shown that these spaces are solid and hences are monotone. The multiplier problem is proved. Some inclusion results are proved. Necessary and sufficient conditions are obtained for the equalities of the inclusions. The Kothe-Toeplitz duals of the spaces $\ell_\infty(E_k,\Lambda,p)$ and $c_0(E_k,\Lambda,p)$ are obtained.

(*c*) Sequence Spaces related to ℓ^p spaces

Let P_s denote the class of all subsets of N, those do not contain more than s elements. Throughout (ϕ_s) represents a non-decreasing sequence of real numbers such that $n\phi_{n+1} \le (n+1)\phi_n$ for all $n \in N$.

(*i*)Let (X,q) be a seminormed space, seminormed by q. Let M be an Orlicz function. The space $m(M,\phi,q)$ is defined as follows :

$$m(M,\phi,q) = \{(x_k)\in w(X) : \sup_{s\ge1,\sigma\in P_s} \frac{1}{\phi_s}\sum_{k\in\sigma} M\left(q\left(\frac{x_k}{\rho}\right)\right) < \infty, \text{ for some } \rho>0\}.$$

It is shown that the above space is a seminormed space, seminormed by

$$f((x_k)) = \inf\left\{\rho>0 : \sup_{s\ge1,\sigma\in P_s} \frac{1}{\phi_s}\sum_{k\in\sigma} M\left(q\left(\frac{x_k}{\rho}\right)\right)\le 1\right\}.$$

The space $m(M,\phi,q)$ a complete seminormed space, when (X, q) is complete. It is shown that the space $m(M,\phi,q)$ is solid, monotone and symmetric. Some inclusion results are proved with one, member as $m(M,\phi,q)$. Necessary and sufficient conditions are obtained for the equality of these inequalities. Some interesting particular cases are also studied.

(*ii*) For $0<p<1$, the space $m(\Delta,\phi,p)$ is introduced as follows :

$$m(\Delta,\phi,p) = \{(x_k)\in w : \sup_{s\ge1,\sigma\in P_s} \frac{1}{\phi_s}\sum_{k\in\sigma} |\Delta x_k|^p < \infty\}, \text{ where } \Delta x_k = x_k - x_{k+1}, \text{ for all } k\in N.$$

It is shown that $m(\Delta,\phi,p)$ is a complete p-normed space, p-normed by

$$g_\Delta(x) = |x_1|^p + \sup_{s\ge1,\sigma\in P_s} \frac{1}{\phi_s}\sum_{k\in\sigma} |\Delta x_k|^p.$$

The space is a K-space. It is neither solid nor symmetric in general. Some inclusion results are proved. Necessary and sufficient conditions are obtained for the equality of these inclusions.

(*d*) Statistically Convergent Double Sequences.

A subset E of N is said to have density $\delta(E)$ if

$$\delta(E) = \lim_{n\to\infty} n^{-1} \sum_{k=1}^{n} \chi_E(k) \text{ exists,}$$

where χ_E is the characteristic function of E. On generalizing the above notion, the notion of asymptotic density for subsets of NxN is defined as follows:

A subset E of NxN is said to have density $\rho(E)$ if

$$\rho(E) = \lim_{u,v\to\infty} \frac{1}{uv} \sum_{n=1}^{u} \sum_{k=1}^{v} \chi_E(n,k) \text{ exists.}$$

A sequence (x_k) is said to be statistically convergent to L, if for every $\varepsilon>0$,

$\delta(\{k\in N: |x_k-L| \geq \varepsilon\}) = 0.$, we write $stat - \lim_{k\to\infty} x_k = L$.

A double sequence $<a_{nk}>$ is said to be statistically convergent to L in Pringssheim's sense if, if for every $\varepsilon>0$, $\rho(\{(n,k)\in N$x$N: |a_{nk}-L| \geq \varepsilon\}) = 0$.

A double sequence $<a_{nk}>$ is said to be statistically Cauchy if, if for every $\varepsilon>0$,there exists $s = s(\varepsilon)$, $t = t(\varepsilon)$ such that $\rho(\{(n,k)\in N$x$N: |a_{nk}-a_{st}| \geq \varepsilon\}) = 0$.

A double sequence $<a_{nk}>$ is said to be statistically regularly convergent, if it is statistically convergent in the Pringsheim's sense and the following single statistical limits exist

$$stat - \lim_{n\to\infty} a_{nk} = x_k, \text{ for each } k\in N$$

and $$stat - \lim_{k\to\infty} a_{nk} = y_n, \text{ for each } n\in N.$$

The decomposition theorem for statistically convergent double sequences is proved. It is shown that a double sequence $<a_{nk}>$ of real numbers is statistically convergent if and only if it is statistically Cauchy. It is proved that the space of bounded statistically convergent in Pringsheim's sense double is not separable. It is proved that "for $0<p<\infty$, a double sequence is strongly p-Cesàro summable to L, then it is statistically convergent to L". Further a bounded double sequence is statistically convergent to L, then it is strongly p-Cesàro summable to L.

Further some works have been done in collaborations with Professor T. Salat and Professor M. Ziman of Comenius University; SLOVAKIA; Professor R. Colak; Professor Mikail ET; Profesor Y. Altin and Dr. M. Isiki of Firat University; TURKEY; Professor A. Esi of Innonu University; TURKEY; Professor B. Choudhary; Botswana University; BOTSWANA and Professor S. K. Mishra of Tribhuvan University; NEPAL. Some of the articles are in press, some of them have been submitted after revision and some of the investigations have been communicated for publication.

Work done on Applied Mathematics (Theoretical Plasma Physics)

The work done in Applied Mathematics is lead by Prof. G.C. Das. Theoretical motivation is to study the nonlinear waves generating various salient features of plasma-acoustic modes bridging the theoretical observations with the experiments. That is why, there is always an uneven competition between the theoreticians and the experimentalists and despite that observations attributed the fewer knowledge in comparison to the actual happenings in the plasma dynamics. However, we made some observations in this direction to highlight some dynamical behaviors of nonlinear waves to derive the soliton dynamics, formation of sheath, soliton radiation, clustering dust atmospheres in space and surrounding atmospheres. The theoretical groups are working on the propagation of ion-acoustic solitary waves in space, as well as with the experiments. The overall observations are studied from the basic equations

Period	:	From March 2004 for 3 years
Project group	:	
	i.	Dr. Arundhuti Devi, Principal Investigator
	ii.	Prof. Dr. K.G. Bhattacharyya, Co- Principal Investigator.

16. Employment Generation Training Scheme for North East and ST/SC/OBC's, sponsored by Ministry of Information Technology, MPD Division, Govt. of India

Total assistance	:	Rs. 15,00,000.00 (Rs. Fifteen lakh) only
Period	:	From 1st April 2001 for 5 years
Project group	:	
	i.	Mr. A. Barman, Principal Investigator

9. OTHER SCIENTIFIC ACTIVITIES:

The Director, Prof. N.N. Dass authored a book "Symmetry and group theory for Chemists", (248 pages), (2003), published by Asian Books Private Ltd, 7/28 Mahavir Lane, Vardhan House, Ansari Road, Darya Ganj, New Delhi 110002, 1st Edition 2004, ISBN 81-86299-59-9, Printed at Yash Printographic, Delhi.

Prof. Joyanti Chutia of Material Sciences Division attended the selection committee meeting as an expert member on Scholarship for Women Scientists and Technologists in May' 2003 at IIT, Mumbai.

Dr. B. C. Tripathy is an Editorial Board member of the Journal Far East Journal Mathematical Sciences.

Dr. B. C. Tripathy is an Editorial Board member of the periodical Journal of Indian Academy of Mathematics

Dr. B. C. Tripathy was the convenor of the National Instructional Workshop on Recent Trends and New Direction of Research in Cybernetics and Systems Theory organized by IASST, funded by Department of Science & Technology (GoI), held during January 28 - February 01, 2004.

Dr. G. Choudhury is elected as an Associate Editor of 'Far East Journal of Theoretical Statistics'.

Dr. G. Choudhury is nominated as Governing Council member for Indian Statistical Association for the year 2003.

Dr. P. Azad Associate Professor, Biofert. Unit, LSD delivered two invited talks at the "Orientation & extension Staff Training on the Use & Development of Bio-fertilizer" held at Agriculture Deptt. Govt. of Assam and sponsored by the RBDC Imphal from Sept. 23 to 26, 2003. The topics of these two invited talks are

(1) Current status of Biofertilizer in NE states.

(2) Rhizobium biofertilizer for pulse crop.

Dr. (Mrs.) Dipali Devi delivered an invited lecture at the workshop held at Seribiotech Laboratory, CSB, Bangalore during the period 10- 11 November, 2003.

Rajlakshmi Devi attended the International Symposium on Recent Advances in Pharmacology in January 7-8, 2004, New Delhi, India

Rajlakshmi Devi attended the XVIII National training program in electron Electron Microscope for Scientific investigators (Basic Course and Advanced Course) AIIMS, New Delhi.

Dr. Jibon Kotoky, Asst. Professor, Life Science Division participated in the 'Frontier Lectures Programme' organized by Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) Bangalore, and IIT, Guwahati at IIT, Guwahati from 29-30 August 2003. Dr. Kotoky, participated also in the National Seminar on Radiation and Bimolecular Techniques in Animal Sciences and Human Health held on 10-12, Feb. 2004, organized by the Department of Physiology and Biotechnology, College of Veterinary Sciences, AAU, Guwahati-22, under the aegis of "Bhaba Atomic Research Centre, Mumbai, Department of Science and Technology, Department of Biotechnology, Govt. of India & North East Council, Shillong.

Dr. Kotoky, delivered a lecture on "Pre-clinical Toxicity Evaluation and Standardization of Herbal Remedies" as a Resource Person in the workshop organized at Govt. Ayurvedic College, Guwahati, sponsored by the Department of Indian System of Medicine and homoeopathy, Ministry of Health and Family Welfare, Govt. of India from 13 - 14 June 2003.

governing the plasma dynamics, which after using special methods have been augmented to the Karlweg-de Vaies (K-*dV*) equation as

$$\frac{\partial \phi}{\partial t} + A\phi\frac{\partial \phi}{\partial \xi} + B\frac{\partial^3 \phi}{\partial \xi^3} + C\phi = 0$$

or Sagdeev potential equation as

$$\frac{1}{2}\left(\frac{d\phi}{d\xi}\right)^2 + V(\phi, M) = 0$$

to study respectively the soliton dynamics or sheath formation in plasmas. Because of different plasma configurations along with the effect of inhomogeneity in plasma, the *K-dV* equation could not be solvable as done earlier during last several decades and thus a new approach, new to plasma physics, have been used for finding the new observations. As a result of which the observations we find, are exactly bridging with experimental observations and observations made by the Freja Scientific satellite in space. Further the observations find the solution radiation which is new thrust area to be observed yet in experiments. Our observations might be an advanced information to the experimentalists.

Secondly research motivation has been augmented to study formation of sheath in plasma wherein the levitation of dust grains gets the formation of dust clouds. Our observation are though theoretical but matching with the satellite observations on the dust flow along the Moon's surface. The dust flow levitated the dust into sheath region forms the dust cloud around the Moon's surface and encourages to continue in this direction in future. Some of the research works are communicated for publication which in turn have been published or accepted for publication.

Work done on Statistics (Applied Stochastic Process)

The work done on Applied Stochastic Process is lead by Dr. G. Choudhury. Queueing theory is a branch of Applied Stochastic process. In classical queueing theory it is usually assumed that a unit who cannot get service immediately after arrival either joins the waiting line (and then is served according to some queueing discipline) or leaves the system forever. There may be some situations where the server may provide a second stage or phase of service after completion of first stage of regular service. This type of system has important applications in model building of a scheduling problem, where all ships arriving at a port may need unloading service on arrival but only some of them may require reloading service soon after the unloading. There are many other situations such as manufacturing process which involve two phase of service. Recently, there have been considerable amount of works done on such types of queueing models e.g. see K.C. Madan [(2000), QUESTA, 34, 37-46] and J. Medhi [(2002), QUESTA, 42, 239-242].Based on their investigations we have further investigated some important models in this year. Following is the brief description of work done with research scholars Ms. M. Paul and Ms. S. Kalita.

1. First of all we have studied on *M*/*G*/1 queue with a second phase of optional service in which the server may provide two phase of heterogeneous service to incoming units. We derive queue size distribution at stationary point of time and waiting time distribution. Moreover we derive the queue size distribution at the departure point of time (i.e. system size distribution) as a classical generalization of well-known Pollaczek- Khinchine formula.

2. In the process of generalization, we generalize the above model for the case of batch arrival case with an additional service channel in which case another unit at the head of queue is taken up for first phase of regular service. For this model we derive the queue size distribution at a random epoch and at a departure epoch. Some important performance measures have also been obtained. This generalized the results of K.C. Madan [(2000), QUESTA, 34, 37-46] and J. Medhi [(2002), 42, 239-242]. It is also observed that our model generalized the classical M^X/*G*/1 queueing system studied by Burke [(1975), Operations Research, 23, 830-833] and M.L. Chaudhry [(1979), Nov. Res. Log. Qurt. 26, 667-674].

3. Next, we study the steady state behavior of an *M*/M/1 queue with a random setup time under *N*-policy with finite

capacity, where the system is turned off each time it becomes empty. The system becomes operative only when exactly 'N' or more customers arrive. As soon as exactly N customers arrive, the setup of service facility begins *i.e.* a random amount of time is required to set the system into action, on completion of which actual service begins. For this model we obtained analytically explicit expressions for the queue size distributions. Some important performance measures of this system have also been obtained. In course of investigation it is observed that the additional queue size distribution caused by the vacation period is a convex combination of two independent distributions viz.

(*i*) Conditional queue size distribution due to a turned off period given that the system is idle and

(*ii*) Conditional queue size distribution due to a setup period given that the system is idle

4. Finally, we study a two phase batch arrival queue $M^X/(G_1, G_2)/1$ queue with a vacation time under Bernoulli vacation schedule, where the server provides to each unit two phases of heterogeneous service in succession, the first phase service followed by the second phase service. As soon as the second phase is completed the channel can start a vacation with some probability p. Other wise, it continues serving next unit in the queue. For this model we derive the queue size distribution at a random epoch as well as at a departure epoch under the steady state conditions. Further, we derive some important performance measures of this system. This generalized the models studied by K.C. Madan [Egyptian Stat. Jour. 44(2000), 39-55; Int. Jour. Syst. Sci. 32 (2001), 837-844]. These investigations are done in collaboration with Professor K.C. Madan of Yormouk University, JORDAN.

More over some on going research problems have been carried out as inter institutional Collaborative research works with Prof. A. Krishnamoorthy, Department of Mathematics, Cochin University of Science and Technology; Prof. A. Borthakur, Retired professor of Department of Statistics, Gauhati University; Prof. K. C. Madan, Department of Yormouk University, Jordan (presently sifted to Ahlia University, Kingdom of Bahrain) and Prof. J.R. Artelejo, Department of Statistics and Operations Research, Complutense University of Madrid, Spain. Outcome of research investigations with these authors have been communicated to some journals in the form of papers for publication and some of them have already been accepted for publication.

Advanced Training Programme for Under-Graduate Students in Mathematics of North-East Region.

The Mathematical Sciences Division conducted an advanced training programme for the under-graduate students in Mathematics of the North-East region during June 23 - July 08, 2003, to motivate the students to choose mathematics as career. It was funded by Department of Science and Technology (Govt. of India). A total of 17 students from different parts of the North-East region attended the training programme. The programme was inaugurated by Professor J. Medhi, Emeritus Professor Gauhati University and Professor Mukti Acharya of Delhi College of Engineering was the Chief Guest on the occasion. The lectures were delivered by the mathematicians from different institutions from the country like Delhi College of Engineering; Indian Statistical Institute; Assam University, Silchar; Tezpur University; Gauhati University; Cotton College Guwahati and some faculties of the Institute of Advanced Study in Science & Technology. Prominent among them are Professor Mukti Acharya of Delhi College of Engineering; Professor R. K. Roychoudhury of the Indian Statistical Institute, Kolkata.

Prof. J. Medhi, Emeritus Professor, Gauhati University is delivering the inaugural speech in the Advanced Training Programme for Undergraduate Students in Mathematics of NE region.

2.3 LIFE SCIENCES DIVISION:

Faculty:

Name:	Field of interest
Dr. N. Deka, Professor	Biochemistry and virology
Dr. P. Azad, Associate Professor	Bio-fertilizer and Bio-control
Dr. A. K. Buragohain, Associate Professor	Molecular Biology
Dr. J. Kotoky, Assistant Professor	Biochemistry / Bioprospecting / Herbal Medicine
Dr. (Mrs.) D. Devi, Assistant Professor	Seri biotech

Life Sciences Division :

This division has four units:

i. Biochemistry and Medicinal plants section
ii. Seri biotech section
iii. Bio-fertilizer section
iv. Molecular biology section

i. Biochemistry and Medicinal plants section

In spite of phenomenal development of the synthetic drug industry and antibiotic, medicinal plants still constitute an important part of pharmacopoeias in both the developing as well as developed countries.

There has been a resurgence of interest in the herbal medicine world wide in recent years. The turn over of plant drugs produced in USA, OECD countries and Japan has been rising and expected to reach 100 billion dollars soon.

Many plants are known to play vital role in the management of various diseases. Many ethnic people of the North Eastern region living in the rural as well as in the hilly areas solely depend upon the remedies prepared from plant sources. Many of such remedies practised by these people in the remote places have miraculous effect in curing some diseases, where modern system of treatment is silent in these cases.

However, effective standardization of these herbal drugs is yet to be developed in order to meet the ever-increasing stringent international regulations, which are now being implemented in India and abroad.

Food is one of the primary needs of human being. Food gets its attraction by its taste, colour and texture and smell. Generally, people get attracted first for its beautiful colours and then the smell of the foodstuffs. For this reasons, the manufacturers have used various colours since the ancient time while preparing the foodstuffs.

In this region also various artificial colours are being used by the manufacturers in the foodstuffs. No work to study the toxicity of these artificial colours used in the foodstuff has been done by any group. We have undertaken this work of qualitative and quantitative evaluation of artificial colours in the foodstuffs available in Kamrup district., Assam.

We had concentrated on the following broad fields, like liver ailments, diabetic mellitus, artificial food colours, bone fracture, heart disease and natural nutrients.

A) Investigation, Evaluation, Standardization of Herbal remedies.

We had surveyed some areas of Kamrup district and interacted with the local herbal/traditional practitioners in the last year and the informations gathered from them about the use of such remedies have been studied for the scientific evaluation.

We have worked on the investigation, evaluation, standardization and development of herbal medicine, which are most effectively used by the people in the villages.

In this connection, we have collected three plants, used by the local people against liver ailments since a long time and have been processed for evaluation of the efficacy against liver ailments. The LD-50/ED-50 of one of the plants (SN-1) has been determined and the evaluation of the efficacy is in progress against albino rats.

B) Artificial colours in foodstuffs:

We have collected food samples from different parts of Kamrup district of Assam. Mainly retail outlets, like small sweet shops, rural markets, daily bazaars, and also from the urban areas.

These samples are processed and qualitative and quantitative estimations of the artificial colours have been made as per standardized methodology in our laboratory. It has been observed so far that in most of the samples colours are used above the permitted level though the colours used are permitted ones.

C) Nutritional value of food plants:

Daily diet taken by us plays a vital role in the in sustaining a healthy, disease free and long life. Many diseases can be arrested, prevented and even cured by manipulating the diet properly. The vegetables included in our daily menu of diet in fact act as remedy in many diseases. People prescribe/give particular vegetables to eat with their food in some ailments to get relief since a long time. During this period we had undertaken jointly with other members of the division, the work of nutritional evaluation of eleven leafy vegetables of the N. E. region for correlation the nutritional value, metallic contents present in the plants under study with the curing of certain diseases. Many micronutrients such as Zinc, Iron, Magnesium, Copper and Calcium are found to be present in sizable amount in these leafy vegetables. Many of these elements function as components of enzymes and often get lost from the vegetable parts when subjected to processing. It has been observed that most of the leafy vegetables without processing are excellent sources of micronutrients for human.

D) Anti-Inflammatory study :

The evaluation of the pharmacological safety of the efficacious plant extracts, against some ailments is very important. Study of one very potent cardio protective plant, *Clerodendron colebrookianum* Walp (Verbenaceae). has also been undertaken and generated the data on pharmacological safety. The methanol extract of this plant has shown excellent anti-inflammatory results i.e. the plant is non-toxic and non- allergic.

Study of the cardioprotective effect of *Clerodendron colebrookianum* (CC) in rat :

Cardiovascular disease is the leading cause of death worldwide, and its prevalence is rapidly increasing in non-industrilized countries. Clinical, epidemiological, and genetic studies convincingly demonstrate that increased concentration of plasma lipid mainly low-density lipoprotein (LDL) cholesterol promotes atherosclerosis. Atherosclerosis of the coronary arteries is the cause of different types of ischemic heart disease, of which myocardial infarction carries the highest risk of morbidity and mortality. According to World Health Organization projection, it is estimated that morbidity and mortality due to cardiovascular disease will reach epidemic proportion and a significant segment of which will be due to ischemic heart disease (IHD) (Report of Ministry of Health and Family Welfare, India, 1996).

Experimental and epidemiological studies support the involvement of oxidative stress in pathogenesis and progression of many diseases including atherosclerosis. Oxygen is indispensable for maintaining life, but sometimes it becomes toxic and results in the generation of most aggressive agents such as reactive oxygen species (ROS). The high reactivity of ROS can trigger a host of disorders in biological systems. Endogenous/exogenous antioxidants are responsible for preventing and neutralizing the free radicals induced damages of tissues. Oxidative stress is an outcome of imbalance between ROS production and antioxidant defenses, which in turn evokes a series of events

deregulating the cellular functions. Hyperlipidemia causes increased level of LDL, which after oxidation produce oxidised-LDL which is deposited in arterial wall. Thus increase in antioxidant defense ultimately prevents the formation of oxidised-LDL, hence reduce atherosclerosis.

Identification of natural substances with significant lipid lowering as well as antioxidant effects and the promotion of their use in population constitute a viable therapeutic option, especially as a primary and/or secondary preventive measure. Nature is a treasure of many important dietary and medicinal plants, which have been used in Ayurveda and folkmedicine. *Clerodendron colebrookianum* (CC) Walp (Verbenaceae) is a medicinal plant used since a long time by the tribal people of northeast India. The leaves of this plant are used to promote health by increasing defence against disease, arresting the aging process and revitalizing the body in debilitated conditions. Therefore, we studied the antioxidant and hypolipidemic potential of CC extracts on the experimental animal in respect to oxidative stress situation in rat.

ii. Seribiotech Unit

Among the plentiful natural resources, silkworm specially the muga (*Antheraea assama Ww*) and eri (*Philosamia ricini*) are unique to the N.E. region. "Silk" the name itself signifies the glory and softness. Sericulture is a fast growing agro business and silk production is still becoming as cottage industry in N.E. region. It promises tremendous potentiality for development in terms of ecology and economy of the country. Keeping all these views in mind research on silkworm has been identified as a thrust area in this Institute. As such the unit of sericulture under the life sciences division has been extended at IASST from 1991.

Muga silkworm: Rearing of muga silkworm at indoor condition has been continued and some biochemical work has been carried out for standardization of the technique. Two colour morphs blue and green have been reared indoor up to third generation and their taxonomical characterization has been done in terms of morphological markings, biochemical estimation and chromosomal study.

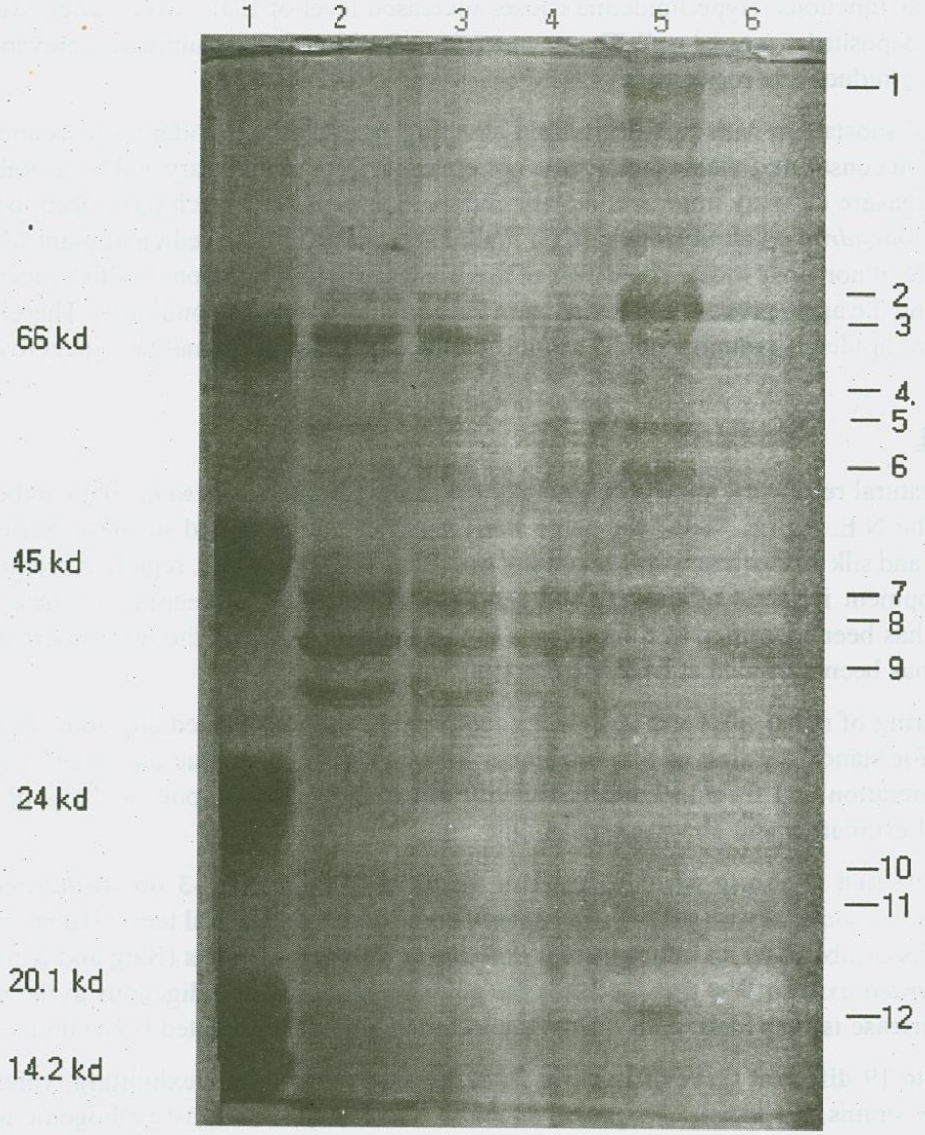
Effect of partially purified protease of *Pseudomonas aeruginosa* strain AC-3 on *Antheraea assama* Ww larvae: Diseases that are associated with pathogenic bacteria come under the general term "flacherie", which refers to the flaccid conditions exhibited by an infected silkworm due to different ailments (Baig and Kumar, 1987). The muga silkworm, *Antheraea assama* Ww that produces the golden-yellow silk is indigenous to the north-east India and incidence of the disease is very high, such that an entire brood may be eliminated (Choudhury, 1981).

We were able to isolate 19 different types of bacteria from diseased muga larvae exhibiting typical syndrome of flacherie. Out of these strains, the isolate designated as AC-3 was found to be most pathogenic to the silkworm (Guha *et al.*, 1999). The strain was identified to be *Pseudomonas aeruginosa* and was designated as *Pseudomonas aeruginosa* strain AC-3 (Choudhury *et al.*, 2002).

In the present study we report the effect of partially purified protease on silkworm larvae, to get an idea on the pathogenesis of *P.aeruginosa* strain AC-3 on muga silkworm larvae. Here, we attempted to partially purify protease from *P.aeruginosa* strain AC-3 and observe its effect on silkworm larvae both under *in vitro* and *in vivo* conditions, with special reference to haemolymph protein profile.

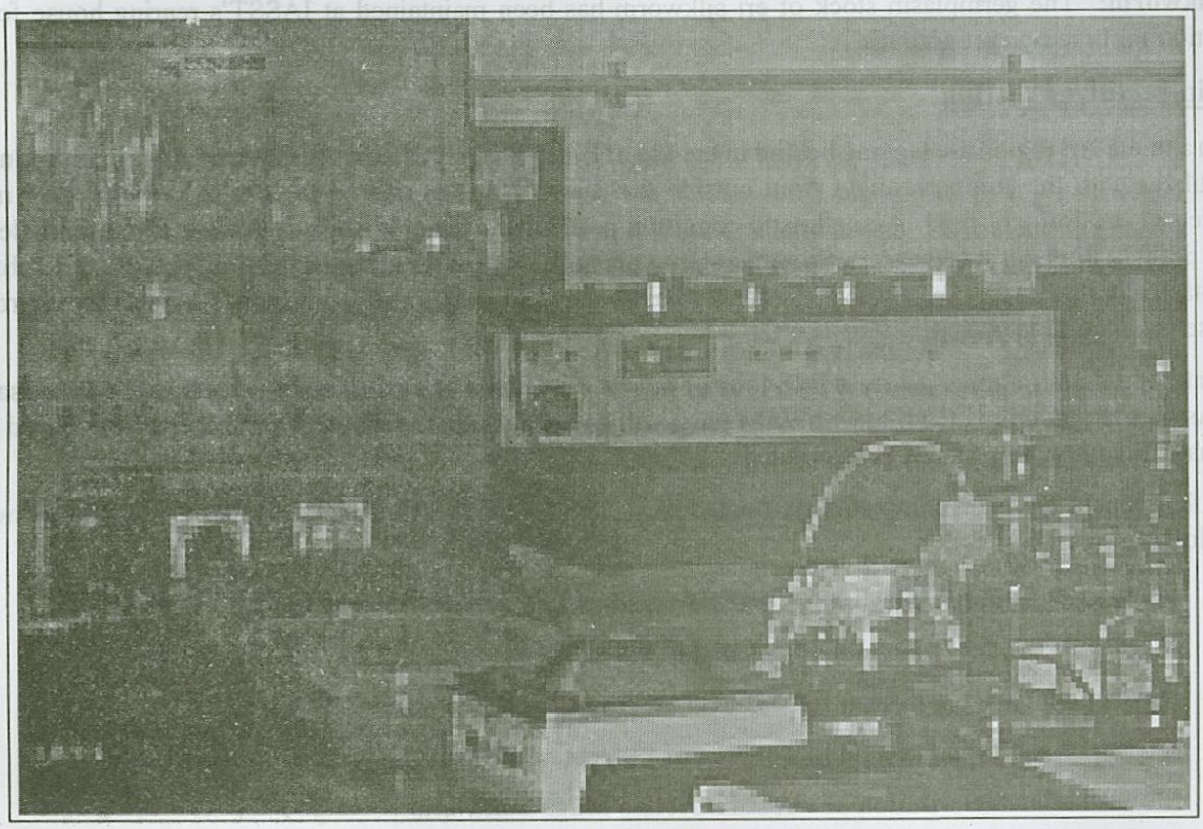
When the test strain was grown in a media containing casein it produced a clear zone of hydrolysis providing evidence for the production of protease by the bacteria. Protease production was found to be maximum when the strain was cultivated for 60h in casein broth. The specific activity was recorded to be 10.20 μg tyrosine released/mg protein/min. Optimum incubation time for protease assay was determined and was found to be 30min. The protease released by the bacteria in casein broth was partially purified by acetone precipitation and subjected to SDS-PAGE. The molecular weight of the partially purified protease was found to be approximately 35,000 da.

To study the effect of the partially purified protease on haemolymph proteins of *A. assama* larvae under *in vitro* conditions, the protease was incubated with haemolymph in different ratios. The protein profile of the samples was then studied after SDS-PAGE analysis. In general, it was found that some of the major protein bands observed in the control haemolymph were totally absent or present in low intensity in the haemolymph samples that had been incubated with the partially purified protease. The low intensity or the complete absence of some of the protein bands in the treated samples suggests that the protease present in them partially or fully degraded the respective original proteins. Some extra bands that had been observed in the protease treated haemolymph samples suggest these to be the breakdown products of the original bands.



SDS-PAGE of incubated mixture of *Antheraea assama* haemolymph and partially purified protease of *Pseudomonas aeruginosa* strain AC-3. Lane1: Standard molecular markers. Lane 2,3 & 4: Protein profile of 1:1, 1:2 & 2:1 partially purified protease and haemolymph mixtures. Lane 5: Protein profile of *Antheraea assama* haemolymph without protease treatment. Lane 6: Protein band of partially purified protease.

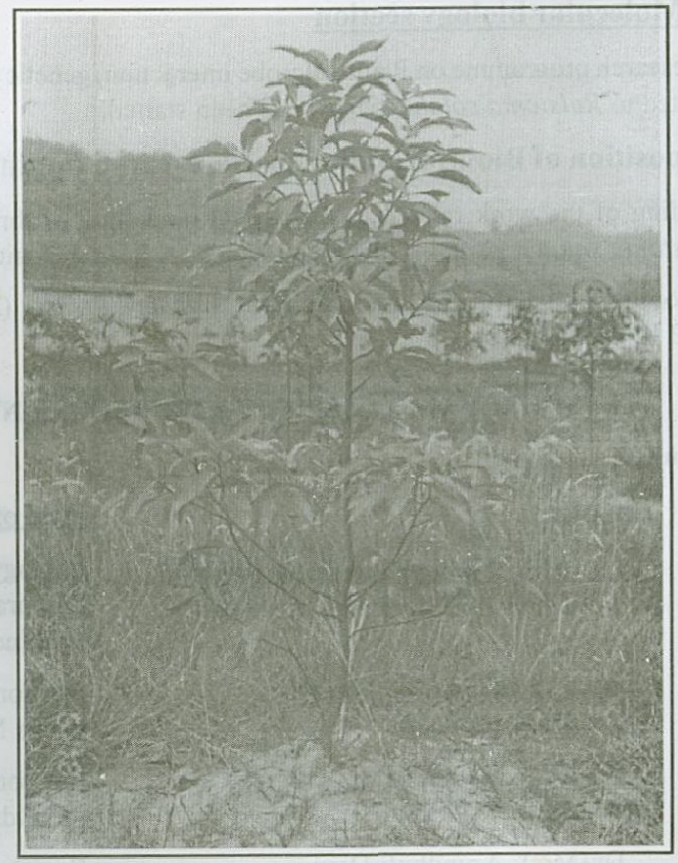
To study the *in vivo* toxic effect of the partially purified protease on *A. assama* larvae, different concentrations of the protease were injected into silkworm larvae. It was observed that the larvae that had been injected with higher concentrations of protease (10 & 25µg) were dead at 16h after injection, whereas, 20 and 55% of larvae that had been injected with lower doses of protease (2.5 & 5 µg) were dead at 22h. When the protein concentration of the haemolymph of the protease treated larvae was compared to that of the respective controls, it was found that the level of protein showed a decrease with an increase in concentration of applied protease. When the haemolymph protein profile of the protease-injected larvae was analyzed by SDS-PAGE, similar results were observed as found in the case of the *in vitro* treatment of haemolymph with partially purified protease.



Part of the Seribiotech laboratory

From the present study it is evident that the protease, partially purified from *Pseudomonas aeruginosa* strain AC-3 is lethal to the larvae of *A. assama*. From the *in vitro* and *in vivo* experiments presented in this study, it is evident that the protease serves to partially or fully degrade biologically important proteins of the silkworm larvae. Further work on this aspect is necessary to ascertain the lethality of protease on silkworm larvae and its role in the flacherie disease of muga silkworm.

Food plant garden: A garden for som plants (*Machilus bombycina* King.) has been set up at IASST new campus at Paschim Boragaon. Cowdung and vermi-compost has been applied for healthy growth of the plant. Effort has been made for improving the hatching percentage of muga silkworm inducing parthenogenesis.



Food plant garden (Som) of muga silkworm at IASST's new campus

Eri silkworm: The germplasm stock of eri silkworm has been maintained at IASST's rearing house for future utilization for breeding programme.

iii. Bio-fertilizer section

Assam and the NE region are lagging behind in the use of Biofertilizer. Till now the Govt. of Assam, is producing the biofertilizer with the strains brought from outside the State of Assam and so the desired results have not been achieved in the formers field. Agroclimatic condition particularly the acid soils of Assam is not suitable for the strains brought from out side the state. So native strains are to be isolated for nitrogen fixation, phosphate solubilization and potash mobilization. In this respect, the IASST has already isolated six native strains of Rhizobia for improvement of pulse production in Assam.

The state of Assam requires nearly 4 lakh tons of pulses per annum as against the production of 64 thousand tons only. As such, Rhizobium blending with VAM fungi will definitely improve the pulse production to a desired level. A systematic study on this aspect is warranted.

The Life Sciences Division completed six funded projects. Presently research activities are being carried out under the following areas:

a) Study of the anti-jaundice (hepatoprotective) plant based remedies used by the local people.

b) Bio-chemical study of action of C. Colebrookianum.

c) Developing isozyme marker for different stocks of Eri Silkworm.

d) Studies on the Effect of dual inoculation of Rhizobia and VAM fungi on pulse Production.

e) Molecular characterization of viruses infecting Muga Silkworm.

f) Studies on the bacterial flatcheri diseases of Muga Silkworm.

iv. Molecular biology section

A research programme on Plant-Microbe interaction, genetic diversity and molecular modelling of protein structures related to *Ralstonia solanacearum* has been started.

Deposition of Bioinformatics based research findings at Protein Data Bank

Finding of the work related to theoretical modelling of three protein of the hrp secretion system and DNAa in *Ralstonia solanacearum*, a plant pathogen have been deposited at PDB against the PDB ID 1Vol, 1Voi and 1 Vog.

Theoretical modelling of lysozyme from *Anthaera assama* (Assam Muga Silk) has been deposited at PDB against PDB ID 1V11.

2.4. RESOURCE MANAGEMENT & ENVIRONMENT DIVISION:

Faculty:

Name	Field of Interest
Dr. (Mrs) Sabitry Choudhury Bordoloi Associate Professor and In-charge,	Ecology, Developmental Biology and Exploration of Faunal Diversity in North East India
Dr. S. Deka, M. Sc., Ph.D. Assistant Professor	Environmental biology (Biodegradation and Waste Management.
Dr. Anuj Barua, M. Sc., Ph.D. Assistant Professor	Environmental biology (Phyto-remediation of Hydrocarbons)
Dr.(Mrs). Arundhuti Devi, Assistant Professor	Environmental Chemistry (Heavy metal and Hydrocarbons)

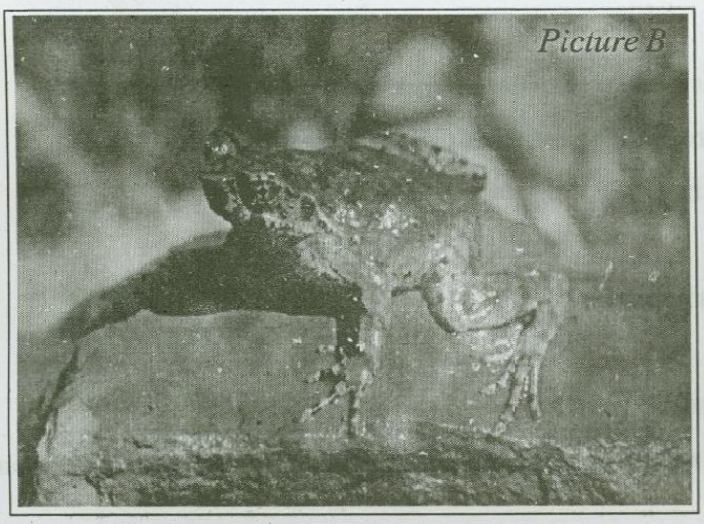
Ecology, Developmental Biology and Exploration of Faunal Diversity in North East India.

The Resource Management and Environment Division of the Institute is conducting Research related to various environmental problems of North East India. Exploration of biodiversity requires immediate attention of scientists in view of deteriorating environmental conditions and global loss of species. At present exploration of Fish, Amphibia and Snake in three states of NE region is in progress.

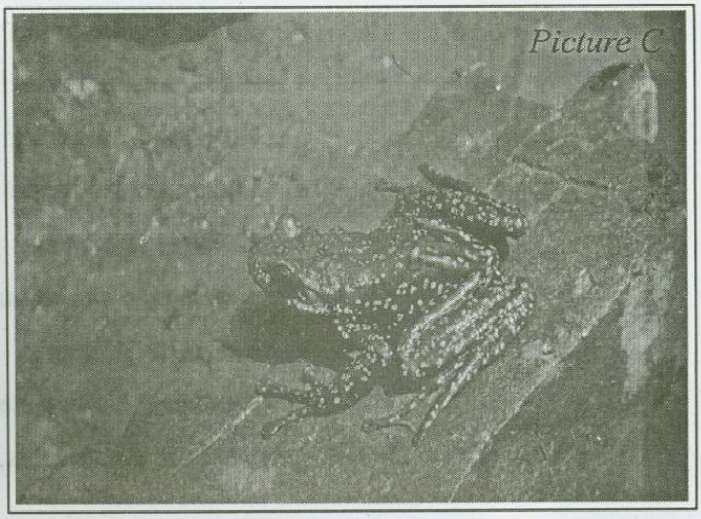
During the year findings on Amphibian fauna of Nagaland are published. The report includes five new record for India and nineteen new records for the state.

Study of Ichthyo faunal diversity in natural wetlands has received priority in view of habitat deterioration and shrinking of natural wetlands. Scientific study in the wetlands of Hajo has not been taken up though the area is contributing in a major way in commercial fish catch since time immemorial and has provided livelihood to 25% of inhabitants. A project has been planned for sustainable utilization of fishery potential in these wetlands and conservation of indigenous species of fishes and wetland biota.

Rhacophorus gongshanensis (Yang & Su, 1984) Photo by Dr. J. Meren Ao
New record for India



Megophrys wuliangshanensis Ye and Fei, 1995
Photo by Dr. J. Meren Ao



Amolops viridimaculatus (Jiang, 1983) Photo by Dr. J. Meren Ao

Picture, A, B & C: Some of the New records for India
J. Meren Ao, SabitryBordoloi and Annemarie Ohler (2003)

Environmental biology (Biodegradation and Waste Management) :

The project on " Utilization of lime sludge waste of Jagiroad paper mill (Morigaon) for fish culture" sponsored by the Indian Council of Agricultural Research (ICAR), New Delhi has been started on July13, 2001, under the supervision of Dr. S. Deka, Assistant Professor as Principal Investigator. The project has been sanctioned for a period of three years w.e.f. July13, 2001 to July 12, 2004. The purpose of the study is two folds: - (i) development of cheaper alternative of lime for pond fish culture in Assam as well as (ii) minimizing the problem of disposal of lime sludge waste of paper mill. Further, the present study is expected to increase our knowledge on the physicochemical characteristics of soil and water of fish culture ponds located in different district, besides filling the gaps in our knowledge on the effect of lime/lime sludge waste on the pond ecosystem and fish growth.

Achievement during the year 2003-04 :

Soil and water samples were collected from some selected ponds, beels, Govt. fish farms and private fish farms of Jorhat and Sivasagar district of Assam. Detailed chemical analysis of the collected water and soil samples has been completed. Water quality parameter of the water of the Aquarium where laboratory monitoring has been done and completed.

Environmental biology (Phyto-remediation of Hydrocarbons) :

Phytoremediation of oil and heavy metal in polluted soil and water in and around oil fields of Upper Assam.

For identification of potential herbs for phytoremediation, herbs from different localities of Digboi and Guwahati were surveyed, collected and tested. The identified herbs are then introduced to different concentration of Crude Oil to see their resistance and degradation potential. The root zone activity of the potential herbs was studied and oil-degrading microbes were isolated. Herbs that are showing good result are Soyabean, Sunflower, Musturd, Citronella, Lemongrass, Mimosa and certain varieties of Poaceae family.

Environment and Tea Garden :

An extensive database has been generated in the website www.nei-envis.org covering all the aspects of 'The Green Industry' with updated online information.

It has links to:

- General articles on tea
- All the Tea Boards in the world
- All the Tea Associations in the world
- Al the Tea Institutes
- All about tea production and area under cultivation
- Detailed information regarding pesticides used in the tea gardens
- Database on organic tea
- Collected tea news
- Tea culture of various countries
- Tea photo Album
- Published News letters

Viewing the large number of queries from the farmers, we are in a process of developing the website in regional language too.

Progress of ENVIS Newsletter :

The first issue of 'TEA ENVIRONMENT' - the quarterly newsletter of this ENVIS node was published in the month of Oct. 2002. Since then the Node has published 4 nos. of newsletter till date. The newsletter has been circulated to all the ENVIS Centres and Nodes in addition to all the concerned Govt. Departments and agencies. The newsletter is also circulated free of cost to all the related institutes, libraries in North East India as well as the

institutions.

At present the collection of the Library is Books; 7107, Current Journals, both Indian and Foreign; 77, Bounds periodicals; 921, Thesis and Dissertation; 163, Research papers; 137, Bulletin, Annual report, News letter etc. 474.

Library automation is going on. The catalogue entries are being prepared by SOUL library management software.

3. RESEARCH PUBLICATIONS IN SCIENTIFIC JOURNALS

1. A. R. Pal, D. Boruah, N. C. Adhikary, H. Bailung and Joyanti Chutia, '*Influence of Electron beam Injection on Plasma Parameters and Sheath in a dc Discharge Plasma*', **Journal of Appl. Phys. 94(10), 6328-6333 (2003).**
2. N. Sen Sarma, A. Dutta and N.N. Dass, '*Ionic Conductivity of Poly (2-Vinyl Pyridinium) Salt in Solid State*', **European Polymer Journal, 39, 1071-1075 (2003).**
3. Pradeep Das, C.N. Saikia and N.N. Dass, 'Thermal Behavior of Some Homogeneously Polymethyl Methacrylate Grafted High L - cellulose products', Journal of Applied Polymer Science, Vol. 93 (2004). (Published online DOI 10.1002. app. 20339).
4. B.C. Tripathy, Mikail Et and Yavuz Altin, '*Generalized Difference Sequence Spaces Defined by Orlicz Functions in a Locally Convex Space*', **Journal of Analysis and Applications, 1(3), 175-192 (2003).**
5. B.C. Tripathy and Mausumi Sen, '*Vector Valued Paranormed Bounded and Null Sequence Spaces Associated with Multiplier Sequences*', **Soochow Journal of Mathematics, 29(3), 313-326 (2003).**
6. B.C. Tripathy and Sabita Mahanta, '*On a Class of Sequences Related to the ℓ^p Space Defined by Orlicz Functions*', **Soochow Journal of Mathematics, 29(4), 379-391 (2003).**
7. B.C. Tripathy, '*On a Class of Difference Sequences Related to the p-normed Space ℓ^p* ', **Demonstratio Mathematica, 36(4), 867-872 (2003).**
8. B.C. Tripathy, '*Statistically Convergent Double Sequences*', **Tamkang Journal of Mathematics, 34(3), 231-237 (2003).**
9. G. Choudhury, '*Some Aspects of an M/G/1 Queueing System with Optional Second Service*', **TOP, 11(1), 141-150 (2003).**
10. G. Choudhury, '*A Batch Arrival Queueing System with an Additional Service Channel*', **International Journal of Information and Management Sciences, 14(2), 17-30 (2003).**
11. S. Kalita and G. Choudhury, '*Analysis of the M/M/1 Queueing System with an Exponential Setup time under N-policy with Finite Capacity*', **IAPQR Transactions, 28(1), 43-53 (2003).**
12. G. Choudhury and K. C. Madan, '*A two Phase Batch Arrival Queueing System with a Vacation time under Bernoulli Schedule*', **Applied Mathematics and Computation, 149, 337-349 (2004).**
13. G. C. Das and Putul Kalita, '*Characteristic Behaviors of Dust Grains in Sheath formed in Plasma with Negative Ions*', **J. Plasma Physics, 69(6), 551-563 (2003).**
14. G. C. Das and Putul Kalita, '*Effect of Trapped Charges in Sheath Formation in Non-isothermal Plasma*', **Indian J. Pure & Applied Physics, 41, 612-620 (2003).**
15. S. K. Baishya and G. C. Das, '*Dynamics of Dust Particles in a Magnetized Plasma Sheath in a Fully Ionized Space Plasma*', **Physics of Plasma, 10, 3733-3745 (2003).**
16. P. Kalita and G. C. Das, '*Characteristic Behaviour of Dust Grains in Magnetized Plasma Sheath*', **Journal of Physics D: Applied Physics, 37, 702-708 (2004).**
17. P. Azad, '*Application of Plastic in Agriculture, Pollution and Management for Eco-Friendly living*', **Published by ICAR from its complex for NEH Region, 9-15, 2004.**
18. Sangeeta Nath and Alak K Buragohain, '*In Vitro Method for Propagation of Centella asiatica (L) Urban by Shoot Tip Culture*', **J. Plant Biochemistry & Biotechnology, 12, 167-169, (2003).**
19. Rajlakshmi Devi and D. K. Sharma, '*Hypolipidemic effect of different extracts of Clerodendron colebrookianum Walp in normal and high-fat died fed rats*', **J. of Ethno pharmacology, 90, 63- 68, (2004).**

mainland India; and also to the interested individuals on request.

Printed data collection from important sources :

Books and printouts from different organizations were collected and are in our ENVIS library. Books are accessible easily; research publication does not reach the mass. We have collected mostly the research publications. Our ENVIS node is making these materials available to others on request.

Interaction with tea producers :

It is very encouraging that some of the tea producers, particularly the small tea growers are interacting with our ENVIS officer. In most cases they enquire about benefits, requirements and procedures for developing organic tea gardens and Node experts are able to make them understand and show them with facts and figures the option - organic farming.

Tea dictionary :

An online tea dictionary is under preparation with the help of experts in the field. The dictionary will be available in the website very shortly with search facility. The dictionary is also being published in parts in the ENVIS Newsletter.

Environmental Chemistry (Heavy metal and Hydrocarbons) :

Assessment of oil field soil (with special references to polyaromatic hydrocarbons) for their eventual, remediation and reclamation.

The research into biodegradation of PAHs in soil is an active area of work where different groups in the world are trying to develop and standardize methods for their degradation. However, very little work has been done in this area in India. At the same time, investigators have not evaluated the optimum chemical environment under which the degradation of the PAHs takes place with an accelerated rate. The present proposal has been mooted in this context, i.e. to look into various aspects of degradation of the PAHs in soil by action of the natural microorganisms present, particularly in the areas of operation of the Oil Companies and to formulate the necessary conditions of physical as well as chemical environment ideal for such degradation. Particular emphasis will be given to study the effect of the presence of various heavy metals on the degradation of the PAHs. The results will help in developing a set of standardized conditions suitable for the natural degradation of the PAHs in an oil field area.

2.5 COMPUTER SCIENCES DIVISION

Faculty :

Name	
Mrs. L.B. Mahanta, M.Sc, DCA	Assistant Professor & In-charge
A. Barman, B.E, M.S,	Assistant Professor
Ms. A. Dutta, MCA,	Assistant Professor
K. K. Baishya, BE (CSE)	Assistant Professor

Computer Sciences Division :

The computer science division was started in 1986 with the objective of imparting training to the students in Computer Science Technology and to offer various Information Technology related consultancy services to Govt./ Semi/Govt./Public organizations/universities/colleges. Since then it has imparted training to at least 1600 candidates through various courses and has recently broadened its objective and included research oriented works too.

Courses undertaken by the division for manpower generation :

a) Regular courses :

The courses that have been offered since inception has been various and in accordance to requirement of that time. In the beginning Six month Diploma Courses were run by the institute of which total of 11 batches were successfully

conducted. The Post Graduate Diploma in Computer Application (PGDCA) recognized by the State Council for Technical Education, Guwahati was started from 1990 and it is still continuing. 12 number of PGDCA batches has been conducted so far. Significantly there has been 90 % induction into jobs of the candidates as feedback reveal.

DOEACC 'A' level course was started in 1995 and up to now 12 batches have been conducted. In fact IASST was the only Institute of Eastern (including West Bengal and Bihar) and the North Eastern Region to be recognized by DOEACC, Department of Electronics, Govt. of India to have the 'A' level in accreditation way back in 1994. In the same year PGDCA of IASST too was recognized by DOEACC as equivalent to 'A' level in accreditation for conducting the Computer courses. Recently the DOEACC society has evaluated all institutes in India running 'A' level and 'O' level courses in terms of competence, performance, prospect etc. and given grades in accordance. The current grade of IASST has been given as 'A' (A+ being the highest grade.)

DOEACC 'CCC' courses were started from 2000 and 6 CCC batches were conducted since then but were discontinued after December 2002 because the 'O' level course were also started in 2001 and too many courses were affecting the quality of training. Since 'O' level courses were started, 6 batches have been successfully conducted. This course is under the Employment Generation Training Schemes (EGTS) for North East and SC/ST/OBC/ funded by Ministry of Information and Communication. The pass percent of students of both 'A' & 'O' level courses are above 55%.

b) Short term courses

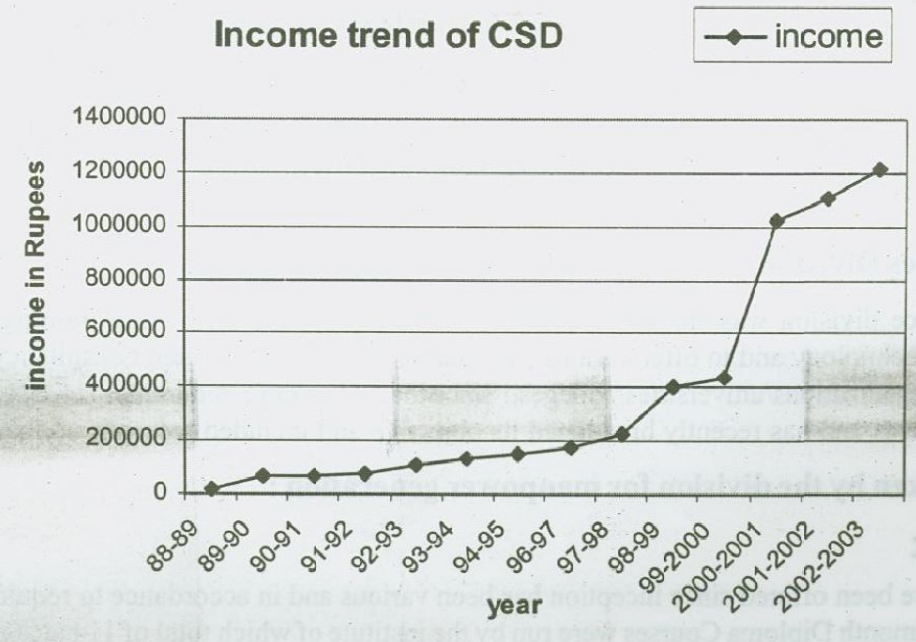
Apart from these regular courses several short-term courses were/are also conducted by the

IASST, mostly on popular appeal. The short term courses conducted so far as follows:-

3 months course	-5 nos.
3 months teachers training (DTE) course	-2 nos.
15 days Special training on MS-OFFICE	-1 nos.
15 days Short term course on "Internet Web Page"	-1 nos.

Income generation of the division :

Since its inception the division has earned more than 61 lakh rupees through its various courses, a substantial amount of which has been utilized from time to time upgradation of the infrastructure of the division. The income trend from 1988-2003 is as follows



Services extended :

The CSD has extended its consultancy services to the Assam Engineering College, Gauhati University, IGNOU, College of Veterinary Science, Secretariat, Govt. of Assam and other Computer Institutes like Omeo Kumar Das Institute of Social Sciences, Electronics Test and Development Center etc for various purposes viz, project evaluation, paper examination, statistical analysis, software development, guest lecture, external examiner etc. It has extended its service in computerization of the IASST library too. The Division recently developed a S/W package for the Chief Minister's Secretariat, Govt. of Assam implementing the E-Governance Framework.

Library support :

The IASST library has one of the largest collections of books in this region with more than 2500 books in computer section alone, with books belonging to all categories of computer and several copies of all prescribed books of the running courses.

Research plans of the division :

In the research area, the Division has already made communications to some well known institutions and medical centers in Guwahati, (viz Guwahati Neurological Research Centre (GNRC) and B.Baruah Cancer Research Institute) regarding some research oriented studies in the field of Cybernetics and is waiting for positive response from their side. The unit is to do this study in collaboration with other related divisions of the institute as well as ISI (Kolkata) and A.I.I.M.S. (New Delhi). It is as a follow up of the recently held Workshop and International Conference on the topic "Cybernetics and Systems Theory", by our Institute. Also the faculty of CSD are being encouraged to take up other research related works in their field of interest in collaboration with other division of IASST and other institutes.

2.6 LIBRARY & INFORMATION CENTRE :

The IASST Library and Information Centre of the Institute of the Advanced Study in Science and Technology, continued to cater to the information needs of the scientists, students, research scholars, of the institute as well as of outside.

The development of library is a continuous phenomenon. The IASST Library and Information Center's collection comprises of documents in the field of Plasma Physics, Polymers, Computer Science & Technology, Mathematics, Statistics, Life Sciences, Medicinal plants, Biotechnology, Sericulture, Bioprospecting, Biofertilizer, Virology, Immunology, Agriculture, Microbiology, Pathology, Genetics, Physiology and Environmental sciences.

The Library has been subscribing for 77 numbers of journals, both Indian and Foreign in the subject of Plasma physics, Polymer sciences, Ecology, Environment, Mathematics, Statistics, Computer and Information Technology. In addition, a number of review scientific journals, newspapers, magazines and books on arts and literature are being collected.

The IASST Library and Information Centre makes provision for the general reading too. Books in Social Sciences and Humanities and some magazines and papers are purchased for this purpose.

Expeditious Photostat service has been continued to be provided to the client through cannon Xerox, machines. During the year 2003-2004, 29,634 Photostat copies of reading material, symposium materials, project etc were made.

The library has continued to provide classified information service such as Current Awareness Service (CAS), Selective Dissemination of Information Service (SDI), Indexing, Reference & Information service, Referral service, Reprographic service, Computerized information service, where database search service through SOUL software, internet search service, E-mail service, Circulation Service and Inter library loan (ILL) to the users.

During the year April 2003 to March 2004, the new addition of the Institute Library is Books; 323, Journals; 2, Bounds periodicals; 115, Theses and Dissertations; 13, Research paper; 5, Bulletin, Annual report, News letter etc. 28, Compact Disk; 12 through purchase, complimentary and gratis copies from some renounced personalities and

20. Rajlakshmi Devi, S.K. Banerjee, S. Sood and S.K. Malik, '*In-vitro and in-vivo antioxidant activity of different extracts of the leaves of Clerodendron colebrookianum Walp in the rats*', **J. of Pharmacy and Pharmacology, 55, 1681-1686, (2003).**

21. J. Meren Ao, Sabitry Bordoloi and Annemarie Ohler, '*Amphibian fauna of Nagaland with nineteen new records from the state including five new records for India*', **ZOOS' Print Journal.Vol.18, No.6, 1117-1125, (2003).**

22. J. Meren Ao and Sabitry Bordoloi, '*Amphibian distribution with respect to water chemistry in the wetlands of Kohima district, Nagaland, India*', **Aquacult Vol. (2). 273-276, (2003).**

4. RESEARCH PAPERS PRESENTED IN NATIONAL/ INTERNATIONAL CONFERENCE / SEMINAR

1. N. C. Adhikary, R. Narayanan, A. N. S Iyergar and Joyanti Chutia, '*Data Acquisition and analysis at the SINP Tokamak*', **18th National Symposium on Plasma Science and Technology (PLASMA-2003)** organised by Birla Institute of Technology, Ranchi, India, during December 08-11, 2003.

2. P. Kalita, A. Sen and G. C. Das, '*Study of viscosity effect in plasma sheath*', **18th National Symposium on Plasma Science and Technology (PLASMA-2003),** organised by Birla Institute of Technology, Ranchi, India, during December, 8-11, 2003.

3. Neelotpal Sen Sarma and N.N. Dass, '*Ionic conductivities of natural silk, cotton and its comparison with synthetic one*', **National Workshop on Science and Technology for Regional Development: Case for North-East India** at IIT Guwahati, during February 3-6, 2004.

4. Dr. B. C. Tripathy, '*Fuzzy Real-Valued Statistically Convergent Sequences*', **International Conference on Recent Trends and New Direction of Research in Cybernetics and Systems Theory** organized by IASST, funded by Department of Science & Technology (GoI), held during January 1-3, 2004.

5. G. Choudhury, '*Single Server Queueing System with two Phases of Service: A Review of Some Recent Developments*', **International Conference on Recent trends and new directions of Research in Cybernetics and Systems Theory**, held at IASST, during January 1-3, 2004.

6. Dipali Devi, J.Deka and D.K. Sharma (Not reported in 2002-03 Annual Report), '*Isozyme variation in the natural population of eri silkworm Philosamia ricini of N.E. region of India*', Abstract Published in the **4th International conference on Wild silk moth** held at Yogykarta, Indonesia on 23-27 April 2002.

7. J. Deka, D.K.Sharma and Dipali Devi (Not reported in 2002-03 Annual Report), '*Racial Diversity of Philosamia ricini in the North Eastern region of India*', abstract Published in the **4th International conference on Wild silk moths** held at Yogyakarta, Indonesia on 23-27 April 2002. Full paper will be coming in proceeding of the conference.

8. Jayanta Deka, Dipali Devi and D.K.Sharma, '*Studies on the racial diversity in Philosamia ricini Boised*',.Proceedings of the ninety fist session of the **Indian congress**, Chandigar, Jan.2003, P-26.

9. Jibon Kotoky, Bedaboti Dasgupta, and Niren Deka, '*Some Pharmacological Properties of Clerodendron colebrookianum Walp*', **National Seminar on Radiation and Bimolecular Techniques in Animal Sciences and Human Health**, organized by the Department of Physiology and Biotechnology, College of Veterinary Sciences, AAU, Guwahati-22, under the aegis of "BARC, Mumbai, DST and DBT, Govt. of India & North East Council, Shillong, held on 10-12, February 2004.

10. Dr. Jibon Kotoky, Asst. Professor, Division of Life Sciences, delivered a Seminar lecture on the Development of Herbal Remedies for liver ailments" at Defence Research Laboratory. Tezpur (DRDO, Govt. of India) on 4th March 2003.

11. A.K. Buragohain, '*Computational Approach to Genome Analysis*', **National Workshop on Recent Trends and New Directions of Research on Cybernetics and Systems Theory** at IASST, Khanapara, Guwahati, during 28 Jan-1 Feb, 2004.

12. A.K. Buragohain, '*Bioinformatics-emerging Trends and Prospects*', **Workshop on Bioinformatics** organized by DOEAC, Guwahati Centre, 18th December, 2003.

13. B. Bera, S. Mohanta, H. Saikia, C.S. Mazumdar, A.K. Buragohain, S. Sanyal, P. Tamuly and M. Hazarika, '*Use of DNA marker in understanding molecular basis of quality tea*', **IX convention, National Symposium of Indian Society of Agricultural Biochemists**, 2003.

14. U. J. Medhi, A. Talukdar and S. Deka, '*Physico- chemical characteristics of lime sludge of paper mill and its impact on soil properties and growth and production of rice*', **National Symposium on Current Trends in Chemical Research** held at Department of Chemistry G.U. on 27-28, February, 2004 and published the abstract, page.84.

15. K. Patowary, H. Das, A. Devi and K.G. Bhattacharya, '*Effects of Mining on the quality of water with particular reference to the metal content in the coal mining areas of Assam*', **National Symposium on Current Trends in Chemical Research** held at Department of Chemistry G.U. on 27-28, February, 2004 and published the abstract, page.87.

5. WORKSHOP ATTENDED:

1. Dr. (Mrs.) Dipali Devi participated in the National Workshop on Seribiotechnology at Seri-Biotech research laboratory, Bangalore organized by Central Silk Board, Ministry of Textile, GoI, held on 10-11th November'2003. With the recommendation of the workshop a collaborative project entitled "Molecular Characterization of Non-mulberry silk of India" has been formulated and it is in the pipeline at DBT, Govt. of India.

2. Dr. P. Azad attended a three weeks short-term training course in Biotechnology during December 1st to December 21st 2003 organized by School of Life Sciences Jawaharlal University, New Delhi. The theme was Molecular Taxonomy of the Symbiotic Fungi .

3. Ms. Bula Choudhury, JRF attended Course on 'Blue Green Algae and Azolla Biofertilizer for Rice' at Indian Agricultural Research Institute, New Delhi, from Sept. 17 to 23, 2003.

4. Ms. Bula Chaudhury JRF, Biofertilizer Unit, Life Sciences Division obtained training on "PCR & ELISA Techniques" organized by ICAR, Borapani, Umium, Meghalay during 18th to 23rd August.

5. Ms. Bula Chaudhury JRF, Biofertilizer Unit, Life Sciences Division attended the workshop on Use of Computer & Internet in Biological Sciences, at Bioinformatics Sub Centre, Dept. of Agricultural Biotechnology, Assam, Agricultural University, Jorhat-13 sponsored by Dept. of Biotechnology during June 26-27, 2003.

6. Dr. J. Kotoky, Life Sciences Division and Dr. Neelotpal Sen sarma, Material Sciences Division attended the National Workshop on "Science and Technology for Regional Development: Case for North-East India" at IIT Guwahati, 3-6 Feb, 2004.

7. Dr. Jibon Kotoky, Asst. Professor, Life Science Division participated in the workshop on Liquid Chromatography held at Bangalore, organized by the WATERS India (Pvt.) Ltd, Bangalore from September 9-12, 2003.

8. Dr. S.C. Bordoloi RM&ED attended the National workshop of peoples Biodiversity Register organized by the Ministry of Environment and Forests, Govt. of India at I.I.Sc. Bangalore, held at Guwahati on Nov. 8-10, 2003.

9. Dr. Anuj Baruah, Asstt. Professor, RM&ED attended the training cum performance evaluation work at Bhubaneswar organized by Environment and Forest, Govt. of Indian on connection with nationwide project of ENVIS, 2003.

10. Dr.(Mrs) A.Devi participated in the workshop on "Frontier Lecture in Chemistry" sponsored by JNCASR,Bangalore and organised by IIT,Gauhati on 29-30 th August,2003.

11. Ms. Borsha Deuri, JRF, RM&ED and Ms. Bula Chaudhury JRF, Biofertilizer Unit, Life Sciences Division, attended the workshop on Bioinformatics organized by DOEAC, Guwahati Centre on 18th December, 2003.

12. Mr. T.D. Goswami, Asstt. Librarian attended the workshop on "Automation of Libraries in North Eastern Region: Trends, Issues and Challenges", jointly organized by Information and Library Network Centre (INFLIBNET), Ahmedabad, and North Eastern Hill University, Shillong, Meghalaya, held at Shillong during

November 6-7, 2003.

6. FELLOWSHIP / AWARDS / Ph. D.:

1. **Prof. Joyanti Chutia** of Material Sciences Division was awarded Ghanashyam Goswami Memorial Award for popular Science writing in March '2004.

2. **Dr. H. Bailung** of Material Sciences Division was awarded Centre of Excellence (COE) invitation Fellowship by Japanese Government. Dr. Bailung worked at the Institute of Space & Astronautical Science, Japan with Prof. Y. Nakamura on diagnostics of Dusty Plasma from May 2003 to September 2003.
3. **Sri Prakash Jyoti Saikia** was awarded Ph.D. degree by Dibrugarh University for his work, "Atom transfer Radical Polymerization of alkyl (metha) Acrylates having pendent alkyl side chains" under the joint guidance of Prof. N.N. Dass, Director, IASST and Dr. S.D. Baruah, RRL, Jorhat-785006.
4. **Ms Purnima Das Bora** was awarded Ph.D. degree by Gauhati University for her work, A study on diversity of Ichthyofauna, assessment of ecological impact on the reproductive behaviour of the genus *Garra* (Hamilton-Buchanan) in the Basistha river of Assam, India" under the guidance of Dr. S.C. Bordoloi, RM & ED, IASST.
5. **Sri Meren Ao** was awarded Ph.D. degree by Gauhati University for his work, "Ecobiology of Hyla annectans (jerdon), 1870 and distribution of amphibian fauna in relation to water quality of nagaland, India" under the guidance of Dr. S.C. Bordoloi, RM & ED, IASST.

7. DISTINGUISHED VISITORS:

Several distinguished visitors like Prof. J. Medhi, Prof. H. C. Pant; CAT, Indore, Prof. D. Dutta Majumder; Former Professor of Indian Statistical Institute, Kolkata, Dr. B. D. Acharaya; DST, New Delhi, Mr. Himanta Bishwa Sarmah; Minister for planning, Prof. Gautam Barua; Director, IIT, Guwahati, Mrs. T. Y. Das; Commissioner and Secretary, DST, Assam, Dr. A. K. L. Bhagat; Integrated Test Range Chandipur, Balasore; Orissa, Prof. D. Medhi; Head, Department of Computer Science, University of Missouri, Kansas City; U. S. A., Prof. Debasis Chandra; Golf Green Urban Complex, Kolkata. Prof. Harish Chandra; Indian Institute of Information Technology, Allahabad, Professor Krishna Dalal; Department of Biophysics, All India Institute of Medical Sciences, New Delhi, Dr. S. R. Kanan, DISI; Universit di Genova Dodecaneso, Genova; Italy, Mr. Pankaj Dutta; Department of Mathematics, IIT Kharagpur, Dr. S. Ramathilagam; Sree Sastha Institute Engineering & Technology Chembarabakkam; Chennai, Dr. Dipankar Roy; Department of CSE, Indian School of Mines; Dhanbad, Professor D. P. Mukharjee; Electronics and Communication Sciences Unit, Indian Statistical Institute, Kolkata, Professor Paramartha Dutta; Department of Computer Science & Engineering, Kalyani Government Engineering College, Nadia, Professor Mahua Bhattacharya; Indian Institute of Information Technology, Kolkata, Professor D. K. Hazarika; Krishi Vigyan Kendra, Assam Agriculture University, Nappam; Tezpur, Dr. Debroop Chakraborty; Electronics & Communication Sciences Unit, Indian Statistical Institute, Kolkata, Professor R. K. Samanta; Department of Computer Science & Application, North Bengal University, Siliguri visited the IASST during the period.

On December 7th Shri. Sharat Barkatoki Hon'ble PWD Minister, Assam along with distinguished litterateur and journalist Homen Borgohain visited our old and new campus and assured the scientists and the staff about the development of the connecting road from NH-37 bye-pass to the new campus.

On january 24, 2004 Sri Himanta Bishwa Sarma, hon'ble Minister of State, Planning and Development, Govt. of Assam visited our Institute and discussed various aspects of development with the scientists. Sri Sarma assured full support from the Govt. of Assam towards the development of the institute. Sri Homen Borgohain, distinguished writer and journalist also graced the occasion.

Other distinguished person visited the institute are: Dr. Anil Goswami; Ex-President Assam Science Society, Dr. Jamini Choudhury; Ex-V.C. Gauhati University Dr. N. K. Choudhury; Ex-V.C. Gauhati University Prof. M. C. Bora; Tezpur University; Tezpur, Prof. P. Bora; IIT Guwahati, Prof. H. Choudhury; Department of Statistics, Gauhati University etc.

The Chief Secretary, GoA and Commissioner and Secretary, D.S.T., GoA visited the new Campus on 30th March 2004.

Dr. B. D. Acharaya met students and researchers of the IASST during the International Seminar on **Recent Trends and New Directions of Research in Cybernetics and Systems Theory** held at IASST. He stressed on the honesty, truthfulness and integrity of the scientists.

Professor H.C. Pant, Visiting Professor, High Energy Physics, Bhaba Atomic Research Centre delivered a lecture on "Studies of Micro cellular Polymer foams" on 29th August to the scientists of the IASST. These foams can be used as targets for laser shock experiments.

Prof. D. Dutta Majumder of Indian Statistical Institute Kolkata addressed the distinguished scientists and elaborated the emergence of the new field of Cybernetics and the system theory. The subject cybernetics emerged through the interaction of the traditional sciences when the scientists were confronted with a set of problems concerned with communication, control and computation in machines and living tissues. The man made machine interfaces with a natural mode of communication can be integrated by unitary approach of General System Theory. The information related to speech, sound, printed characters, cursive scripts, photographic images, ECG, EEG, EMG, X-ray photograph, business management, neuro-computation, immuno-computation, biological photographs are connected to Cybernetics & Systems Theory

8. ON GOING PROJECTS:

1. Upgrading of IASST

Total assistance	:	Rs. Rs. 9,55,00,000.00 (Rs. Nine crores fifty lakh) only.
Received so far	:	Rs. 7,70,00,000.00 (Rs. Seven crores seventy thousand) only
Period	:	From 9th April 1999 to 31st March, 2004.
Transaction	:	Through Director, IASST.

2. Development of Plasma Physics Division, IASST, sponsored by the Department of Science & Technology, Govt. of India

Total assistance	:	Rs. 83,29,800.00 (Rs. Eighty three lakh twenty nine thousand eight hundred) only. *(revised)*
Period	:	From 1st May 1997 to 30st June, 2003

Research group:

i. Prof. Joyanti Chutia, Principal Investigator
ii. Prof. G. C. Das, Co-Investigator
iii. Dr. H. Bailung, Co-Investigator
iv. Bornali Singha, SRF
v. Dibyajyoti Boruah, SRF.
vi. Arup Ratan Pal, SRF.
vii. Ms. Putul Kalita, SRF.

3. Microwave reflectometry for plasma density measurement in Tokamak plasma, Sponsored by DST, Govt. of India

Total assistance	:	Rs. 13,65,000.00 (Rs. Thirteen Lakh sixty five thousand) only
Period	:	From 21st Sept, 2002 for 3 years
Research group	:	

i. Dr. H. Bailung, Principal Investigator
ii. Prof. Joyanti Chutia, Principal Co-Investigator
iii. Prof. Robin Pal, SINP (Kolkata), Principal Coordinator.
iv. Mr. H. K. Gogoi, JRF

4. 'Metal Oxide Deposition Process by RF Magnetron Sputtering' sponsored by DAE, Govt. of India.

Total assistance	:	Rs. 16,88,000.00 (Rs. Sixteen lakhs eighty eight thousand only).
Period	:	From 1st September, 2003 to 31st August 2005..

Research Group :

v. Prof. Joyanti Chutia, Principal Investigator
vi. Dr. H. Hailing, Principal Co-Investigator
vii. Prof. Robin Pal, SINP (Kolkata), Principal Coordinator.
viii. Mr. B. K. Sarma, JRF

5. Studies on Some batch Arrival queueing Models with vacations, sponsored by Dept. of atomic Energy, Govt. of Assam

Total assistance : Rs. 3,33,780.00 (Rs. Three lakh thirty three thousand seven hundred eight) only
Period : 1st April 2002 for 3 years
Research group :

i. Dr. G. Choudhury, Principal Investigator
ii. Ms. M. Paul, JRF.

6. Nonlinear waves studying the coherent structures of soliton radiation, spike, shockphenomena in waves, Sponsored by University Grants Commission; New Delhi.

Total cost of the project Rs. 3,77,500.00 (Rs. Three lakh seventy seven thosand five hundred only) .
Period : From 1st. April 2002 for 3 years.
Research group :

i. Professor G. C. Das, Principal Investigator
ii. Dr. N. Devi ; Co- Principal Investigator. (Department of Mathematics , Cotton College)
iii. Ms. Chandra Biswas, JRF.

7. Database of R&D Institutions by broad research Areas in N.E. Region and Research activities in S&T in Assam, Sponsored by

Total cost of the project Rs. 11,77,200.00 (Rs. Eleven lakh seventy seven thosand two hundred only).
Period : From 1st. April 2004 for 2 years.
Research group :

i. Professor J. Medhi , Principal Investigator
ii. Mr. D.N. Das, Co- Principal Investigator.

8. Studies on Native VAM Fungi and Their combined Phizobia for enhancing pulse production in NE states

Total assistance : Rs. 8,31,000.00 (Rs. Eight lakh thirty one thousand) only
Period : From 15th March 2003 for 3 years
Research group :

i. Dr. P. Azad, Principal Investigator
ii. Dr. S. Deka, Co-Principal Investigator
iii. Ms. B. Choudhury, JRF

9. Development of Herbal remedies for Liver Ailments sponsored by DRDO, Ministry of Defence, Govt. of India.

Total assistance : Rs. 4,97,000.00 (Rs.four lakh ninety seven thousand) only
Period : From October 2003 for 3 years
Project group :

i Dr. Jibon Kotoky, Principal Investigator
ii Ms. Bedabati Dasgupta, Project Assistant

10. **Assessment of Risks due to intake of Artificial Colours through Foodstuffs available in the District of Kamrup (Undivided) sponsored by Assam Science, Technology and Environment Council, Govt. of Assam.**

Total assistance : Rs. 71,000.00 (Rs. Seventy one thousand) only
Period : From October 2003 for 1 year
Project group :
i Dr. Jibon Kotoky, Principal Investigator
ii. Mr. Jitu Saikia, Project Assistant

11. **Utilization of lime sludge waste of Jagiroad paper mill for fish culture, sponsored by ICAR, New Delhi.**

Total assistance : Rs. 11,34,244.00 (Rs. Eleven lakh thirty four thousand two hundred forty four) only
Period : From 13th July 2001 to 12th July 2004.
Research group :
iii. Dr. S. Deka, Principal Investigator
iv. Dr. (Mrs) A. Devi, Co-P.I
v. Mrs. Shabeena Yasmin, JRF
vi. Ms. Abhilasha Mohan Bora, JRF

12. **Phyto-remediation of oil and Heavy metal in polluted soil and water in and around oil fields of Upper Assam sponsored by Oil India Ltd. Duliajan, Assam**

Total assistance : Rs. 11,82,000.00 (Rs. Eleven Lakh eighty two thousand) only
Period : From February, 2002 for 2 years
Research group :
i. Dr. A. Baruah, Principal Investigator
ii. Mr. Saptarshee Bhattacharya, JRF
iii. Ms. Borsha Deuri, JRF

13. **Environmental problems in Tea Gardens, sponsored by Ministry of Environment & Forests, Govt. of India.**

Total assistance : Rs. 7,95,000.00 (Rs. Seven Lakh ninty five thousand) only
Period : From 1st April 2002 to 30th June 2003
Research group :
i. Dr. A. Baruah, Programme officer
ii. Mr. Utpal Kalita, IT Assistant
iii. Mr. Biswajit Chakravarty, JRF
iv. Md. Fareed, JRF

14. **Ichthyo faunal diversity and fishery potential in the wetlands of Hajo, Kamrup District, Assam and study of socioeconomic status of fisherman community sponsored by G.B.Pant Institute of Himalayan Environment and Development, Kosi-Katarmal, Almora.**

Total assistance : Rs. 5, 42,294.00 (Rs. Five lakh forty two thousand two hundred ninety four) only
Period : From March 2004 for 3 years
Project group :
i. Dr. S.C. Bordoloi , Principal Investigator

15. **Assessment of oil field soil (with special reference to polyaromatic hydrocarbons) for their eventual remediation and reclamation sponsored by Department of Biotechnology, Ministry of Science and Technology, GOI, New Delhi**

Total assistance : Rs. 18,48,000.00 (Rs. eighteen lakh forty eight thousand) only

Dr. Kotoky, delivered a lecture on "Pre-clinical Toxicity Evaluation and Standardization of Herbal Remedies" as a Resource Person in the workshop organized at Govt. Ayurvedic College, Guwahati from 13 - 14 June 2003.

Dr. Kotoky delivered a lecture on "Evaluation & Standardization of some Traditionally used remedies against liver Ailments" in the 'Frontier Lectures Programme' organized by Jaharlal Nehru Centre for Advanced Scientific Research (JNCASR) Bangalore, and IIT, Guwahati at IIT, Guwahati from 29-30 August 2003.

Ms. Bula Chaudhury JRF, Biofertilizer Unit, Life Sciences Division and Ms. Borsha Deuri, JRF, RM&ED had arranged a practical demonstration on different microbial techniques for the 12th standard students of Kendrya Vidyalaya, Khanapara on 16-17 December 2003

Ms. Bedabati Dasgupta. Research Scholar, Life Science Division Participated in the National Seminar on Radiation and Bimolecular Techniques in Animal Sciences and Human Health held on 10-12, Feb. 2004, organized by the Department of Physiology and Biotechnology, College of Veterinary Sciences, AAU, Guwahati-22, under the aegis of "Bhaba Atomic Research Centre, Mumbai, Department of Science and Technology, Department of Biotechnology, Govt. of India & North East Council, Shillong.

Dr. S. Deka delivered a talk on 'Biofertilizer and Environmental Pollution' Organised by Regional Biofertilizer Development Corporation, Imphal held at Agricultural Department, Khanapara, Guwahati 22 on September 24 & 26, 2003.

Dr. Sabitry Bordoloi delivered an invited lecture in the National Workshop on Biodiversity Research: Challenges strategies and future prospects (Nov 26-27,2003) Organized by Centre of Biodiversity, Arunachal University on 'Diversity of Amphibian fauna in Eastern Himalayan Region with Special reference to Arunachal Pradesh'.

Paper and species reported by Dr. Sabitry Bordoloi have been included in the database of the Information Division of National Chemical Laboratory, Pune.

Dr.Anuj Baruah delivered an invited "popular talk" at Dimoria College on February 10, 2004 on 'Biodiversity of North East India'

An online tea dictionary is under preparation and the dictionary will be available in the website very shortly with search facility. The dictionary is also being published in parts in the ENVIS Newsletter and also published by the Institute.

Farewell Meeting :

All the staff members of the IASST bade farewell to Dr. M.K. Kalita, Registrar, IASST and Dr. G.C. Das, Professor & Head Mathematical Sciences Division on 9th January, 2004. Meeting was chaired by Prof. K.M. Pathak, Chairman of the IASST and attended by distinguished guests like Prof. J. Medhi, Prof. P.C. Bora, Prof. J.M. Choudury, Prof. B. Deka and others. The work and vision of Dr. M.K. Kalita and Prof. G.C. Das were remembered in the occasion.

10. EQUIPMENTS / INSTRUMENT AVAILABLE AT THE IASST

Name of the Equipment	Make & Model	Funding Agency
1. Phase contrast Microscope	Leica Letiz biomed	DBT, Govt. of India
2. Microwave Generator and Zero Bias Detector	Elva, Russia	DST, GoI.
3. U. V. spectro photometer Japan, UV - 1601	Shimadzu corporation	Institute Fund
4. Atomic Absorption Spectrophotometer	Shinmadzu - 850	Institute Fund
5. GLC	Chemito, 8510	Institute Fund
6. HPLC	Waters, 600E	Institute Fund
7. Microwave digester	Prolabo, Ethas 900	Institute Fund
8. FTIR	Bruker, Veetar 22	Institute Fund
9. Electrophoresis Gel Documentation	Pharmacia Biotech	Institute Fund

10. Cold centrifuge	Sorvall Rc 26 plus	Institute Fund
11. Deep Freeze (quickfreezer)	Remi, UDF - 165	Institute Fund
12. Auto analyser	Merck, Microlab 100	Institute Fund
13. M300 Monochromator Model: M300	Bentham, UK	Institute Fund
14. RF & D.C. Sputting Unit Model: MSPT 12	Hind High Vacuum, India	Upgrading, DST, GoI
15. LECROY Digital Storage, Oscilloscope	Lecroy USA LT 264 DSO	DST Project, GoI
16. Mass Flow Controller with accessories 316 SS	Alborg USA	Upgrading, DST, GoI
17. Sourval Ultra Centrifuge	Model utltra 80	Upgrading, DST, GoI
18. Deep freezer - 20^0	UDF - 165	Institute Fund
19. Gene Amp PCR system 2400	A & B Biosystems	Upgrading, DST, GoI

There are altogether 30 computers with present market values about four and half lakhs.

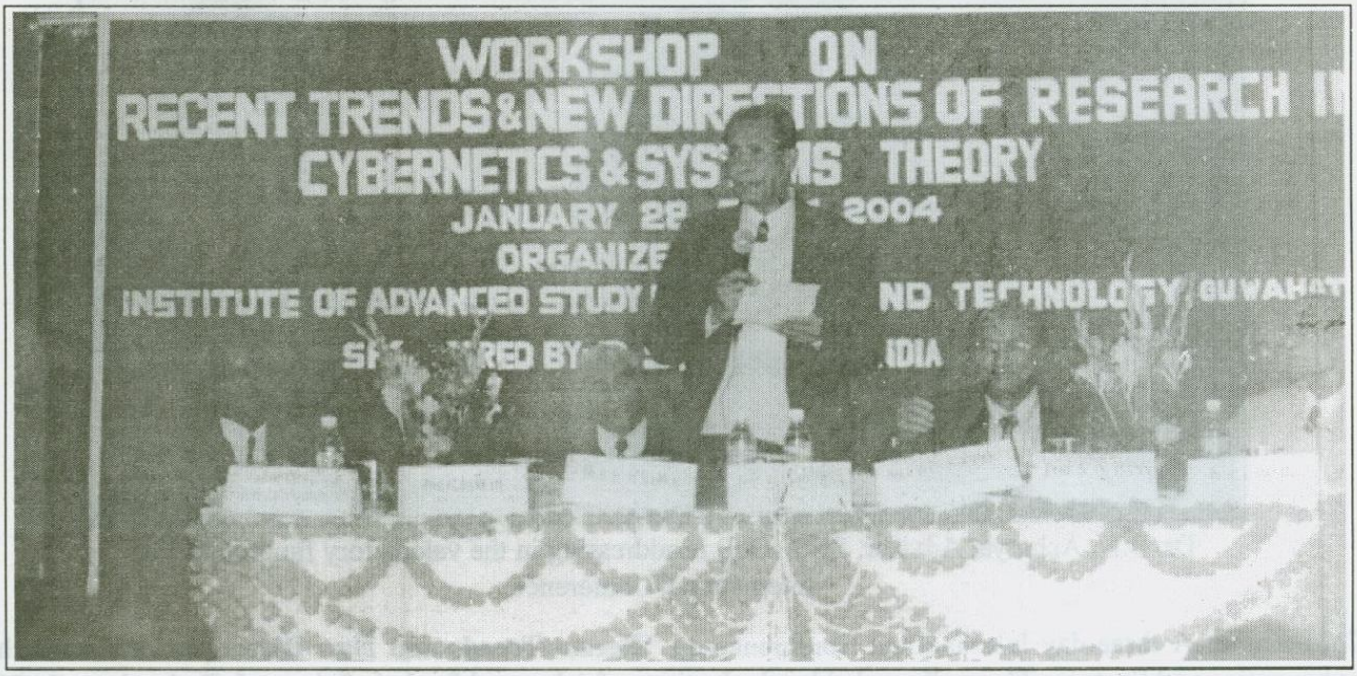
11. SYMPOSIUM / SEMINAR TALKS ORGANISED BY THE IASST:

IASST has organized successfully an International Conference (1st -3rd January 2004) and a National Workshop (January 28- February 1, 2004) financed by DST.

Dr. B.D. Acharya, Advisor, DST (GoI) is addressing in the valedictory function of the International Conference

Conference: A three-day International Conference on **"Recent Trends and New Directions of Research in Cybernetics and Systems Theory"** was held at the Institute of Advanced Study in Science & Technology (IASST), Guwahati during January 1, 2004 and January 3, 2004. The conference, which was sponsored by the Department of Science & Technology (DST), Govt. of India, was attended by a large number of scientists and research scholars from the country and abroad. Inaugurating the International Conference, the Governor of Assam, Lt. Gen. (Retd.) Shri Ajai Singh expressed the hope that the Conference on such an important subject like cybernetics will open up new opportunities of research besides expanding the limits of the current understanding of diverse systems - involving man, machine and society at large. Steering the proceedings of the conference through the deliberations in each of the seven technical sessions, Professor D. Dutta Majumder, Emeritus Professor, Indian Statistical Institute (ISI), Kolkata - an internationally reputed authority in the field of cybernetics and

Prof. D. Dutta Majumder is delivering the Keynote Address in the inaugural function of International Conference



Members on the dais in the National Instructional Workshop

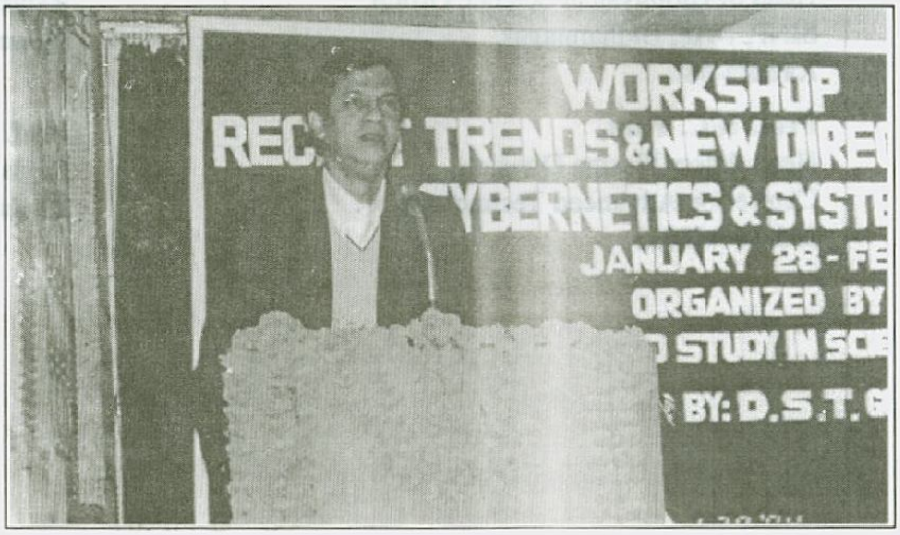
systems science, highlighted the different systems and situations where cybernetics approach could throw new light for better understanding and control. Earlier, during his keynote address on the first day of the conference, Professor Dutta Majumder discussed at length the history, evolution and scope of cybernetics. It may be mentioned that besides the scientists of the host institute, IASST, several eminent faculties and scientists from a number of Universities and Institutes from all over the Country and abroad like, Wisconsin University, USA, University of Genova, Italy, IITs, BITS, Pillani, All India Institute of Medical Sciences, Delhi University, Mysore University,

Sikkim Manipal Institute, Indian Institute of Information Technology, Allahabad presented their papers in different aspects of cybernetics.

Workshop: The institute organized a **"National Instructional Workshop on Recent Trends and New Directions**

Prof. K.M. Pathak, Chairman IASST is delivering the presidential address in the National Instructional Workshop

of Research on Cybernetics and Systems Theory" held during Jan.28 to Feb.01, 2004. The inauguration ceremony was presided over by Prof. K. M. Pathak, Chairman of the IASST, inaugurated by Prof. Gautam Barua, Director, I.I.T.G. It was addressed by Dr. B.D. Acharya, Advisor, DST, GoI as the Chief Guest and Prof. N.K. Choudhury, Ex-V.C., G.U. and Prof. Jyoti Medhi as guests of honour. Prof. N.N. Dass, Director welcome the resource persons and the participants and Prof. Joyanti Chutia offered the vote of thanks. The Workshop began with the keynote address given by Prof. D. Dutta Majumder, Professor Emeritus, ISI Kolkata and Director, Institute of Cybernetics Systems and Information Technology, Kolkata. 40 participants from different parts of the country including 12 from IASST participated and 13 distinguished Scientists from ISI Kolkata; Tezpur University; IIT Guwahati; AIIMS, New Delhi; DST, New Delhi; University of Hyderbad; Assam Agriculture University, Tezpur; North Bengal University; IASST, Guwahati; Indian Institute of Information Technology, Kolkata; delivered lectures during the programme.



Prof. Gautam Barua, Director, IIT (G) is delivering the inaugural speech in the National Instructional Workshop

12. CONSTRUCTION OF THE IASST CAMPUS :

The IASST has been housed in the rented premises of the Assam Science Society and some individuals at Khanapara, Guwahati.

The Government of Assam has allotted to the IASST a plot of land measuring 20 acres at Pachim Boragaon in Greater Guwahati to set up its Complex. The DST, Govt. of India, was kind enough to sanction in 1998 a sum of Rs. 9.55 crores under the scheme 'Upgrading the IASST' in order to generate infrastructure for research including laboratories, buildings, sophisticated equipment etc. Out of the sanctioned fund, an amount of Rs. 6.50 Crore has been earmarked for building and other components.

The construction works of the IASST Complex has been initiated since January 2000. The construction of the building is 99% complete and is ready for inauguration.

13. COUNCIL OF THE INSTITUTE OF ADVANCED STUDY IN SCIENCE 7 TECHNOLOGY (2003-2004):

1. **Prof. K.M. Pathak,**
   Chairman, Council of IASST
   Guwahati 781 022
2. **Prof. N.N. Dass,**
   Director, IASST, Guwahati 781 022
3. **Prof. Asis Datta,**
   Vice-Chancellor,
   Jawaharlal Nehru University,
   New Delhi 110 067
4. **Dr. R.C. Srivastava,**
   Ministry of Sci. & Tech.,
   DST, Govt. of India, Technology Bhavan,
   New Mehrauli Road, New Delhi-11016
5. **Ms. T.Y. Das,**
   Commissioner and Secretary
   to the Govt. of Assam,
   Deptt. of Science, Technology and Environment
   Dispur, Guwahati 781006
6. **Prof. J.K. Datta Gupta,**
   Head of Biophysical Science Group,
   SINP, 1/AF, Bidhannagar,
   Kalkata-64
7. **Prof. H.C. Pant,**
   Head, Laser Plasma Division,
   Centre for Advanced Technology,
   Indore-452013
8. **Dr. G. Barua,**
   Prof. & Head, C.S.E., IIT Guwahati,
   North Guwahati, Guwahati 781 039
9. **Dr. P.C. Deka,**
   Dean, faculty of Agriculture,
   Assam Agricultural University,
   Jorhat 785 013
10. **Prof. B.C. Kalita,**
    Deptt. of Mathematics,
    Guwahati University,
    Guwahati 781 014
11. **Sri J.K. Borooah,**
    Barunagar Tea Estates Pvt. Ltd.,
    Maniram Dewan Road,
    Chandmari, Guwahati 781 003
12. **Prof. (Ms.) Joyanti Chutia,**
    Professor and Head,
    Material Sciences Division,
    IASST, Khanapara, Guwahati 781022
13. **Dr. M. K. Kalita** (Retired on 31.12.03)
    Registrar, IASST, Khanapara,
    Guwahati 781 022

Prof. (Ms.) Joyanti Chutia
Registrar i/c, IASST
Khanapara, Guwahati 781 022

ANNUAL ACCOUNTS OF 2003-2004

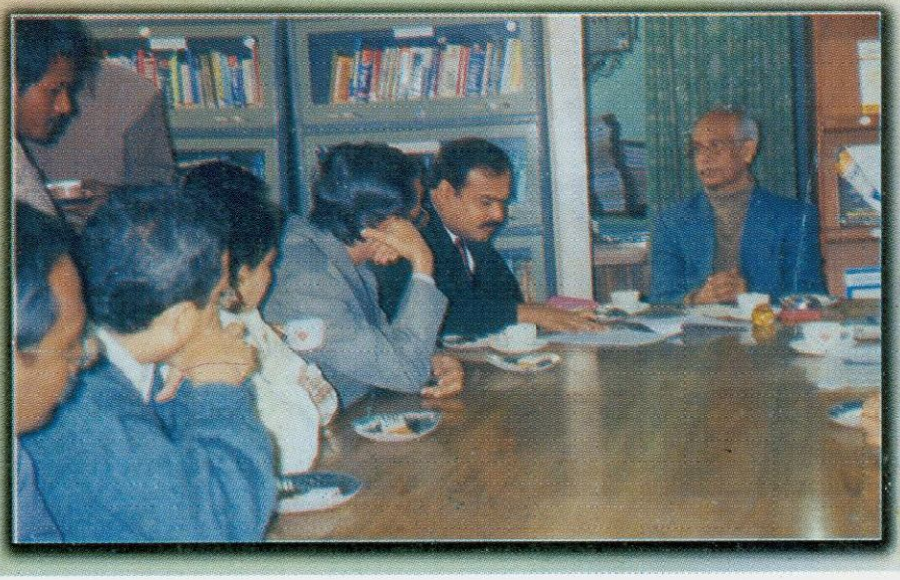
Project Division-wise summary of Receipt and payment Accounts of the IASST for the year ended 31st March 2004(2003-2004)

Sl. No	Head of Account	Opening balance as on 1st April'03	Receipt during the Year 2003-04	Total Amount Received	Payment during the year 2003-04	Closing balance as on 31st March'04
1.	Development of Plasma Physics Division	(-) 1,79,178.00	7,00,000.00	5,20,822.00	5,90,537.00	(-)69,715.00
2.	Up-grading the IASST	53,30,671.00	50,00,000.00	1,03,30,671.00	1,05,27,230.00	(-) 1,96,559.00
3.	Entry of polyclic...soil from Oil. ...degradation.	(-) 17,091.00	Nil	(-) 17,091.00	Nil	(-) 17,091
4.	General Management	(-)1,02,82,985.00	40,00,000.00	(-) 62,82,985.00	62,59,890.00	(-) 1,25,42,875.00
5.	IASST General Fund	1,16,01,504.00	13,65,042.00	1,29,66,546.00	10,01,109.00	1,19,65,437.00
6.	Land and Building	1,36,010.00	Nil	1,36,010.00	Nil	1,36,010.00
7.	'O'level (EGTS) to North East	(-)1,00,060.00	1,00,000.00	(-)60.00	59,100.00	(-) 59,160.00
8.	Utilization of Lime sludge.....Fish Culture	1,64,137.00	2,88,052.00	4,52,189.00	4,23,348.00	28,841.00
9.	Studies on Some Batch Arrival...with vacation.	(-)7,542.00	1,62,312.00 8,857.00	1,63,627.00	1,30,976.00	32,651.00
10.	Silk Industries	13,165.00	64,904.00	78,069.00	47,155.00	30,914.00
11.	Training programme in Mathematics	Nil	1,76,000.00	1,76,000.00	1,76,000.00	Nil
12.	ENVIS Problems in Tea Garden	(-) 1,97,318.00	2,32,500.00	35,182.00	4,41,282.00	(-) 4,06,100.00
13.	Phytoremediation...soil & water...field of Upper Assam	1,41,779.00	Nil	1,41,779.00	1,55,822.00	(-) 14,043.00
14.	Microwave reflectametry.... .....Tokmak Plasma	8,22,507.00	Nil	8,22,507.00	9,08,428.00	(-) 85,921.00
15.	Workshop Govt. of Assam	Nil	1,00,000.00	1,00,000.00	Nil	1,00,000.00
16.	Meeting for the project 'Devel... of Plasma Physics Division'	(-) 5,132.00	Nil	(-) 5,132.00	Nil	(-) 5,132.00
17.	CSIR (Math.) (Karabi Devi)	Nil	Nil	Nil	65,260.00	(-) 65,260.00
18.	CSIR (A. Choudhury)	Nil	1,62,573.00	1,62,573.00	1,62,573.00	Nil
19.	CSIR (Plasma)	Nil	2,11,296.00	2,11,296.00	2,11,296.00	Nil
20.	Native VAM Fungi	Nil	3,94,000.00	3,94,000.00	3,69,494.00	24,506.00
21.	Study of Metal deposition... ...RF... Sputtering.	Nil	12,59,000.00	12,59,000.00	5,48,103.00	7,10,897.00
22.	Education.	Nil	4,00,000.00	4,00,000.00	4,00,000.00	Nil
23.	R&D Organisation, DRL, Tezpur	Nil	1,94,000.00	1,94,000.00	81,179.00	1,12,821.00
24.	Non-linear waves studying.....	Nil	2,23,750.00	2,23,750.00	57,167.00	1,66,583.00
25.	Financial assistance from ASTEC for food colour	Nil	50,000.00	50,000.00	31,812.00	18,188.00
26.	National & International Workshop	Nil	6,50,000.00	6,50,000.00	4,91,400.00	1,58,600.00
	Total	74,20,467.00	1,57,42,286.00	2,31,62,753.00	2,31,39,161.00	23,592.00
27.	Reserve Fund (fix deposit)	11,84,800.00	Nil	11,84,800.00	Nil	11,84,800.00
28.	Corpus Fund for leaves salary encasement	2,00,000.00	Nil	2,00,000.00	Nil	2,00,000.00
	Grant Total	**88,05,267.00**	**1,57,42,286.00**	**2,45,47,553.00**	**2,31,39,161.00**	**14,08,392.00**

Council members of the IASST
Prof. P. Mahanta and Prof. N.K. Choudhury
in a discussion with
Prof. R. Chidambaram, Principal
Scientific Adviser to the Prime Minister,
Govt. of India.

Council members of the IASST
(2002 - 2004)

Prof. V.S. Ramamurthy, Secretary, DST, Govt. of
India with the Chairman of the IASST Council
Prof. K.M. Pathak and
Director, IASST Prof. N.N. Dass.



Sri Himanta Bishwa Sarma,
Hon'ble Minister of State,
Planning & Development, Govt.
of Assam in a discussion with
the Director and the scientists of
the IASST.

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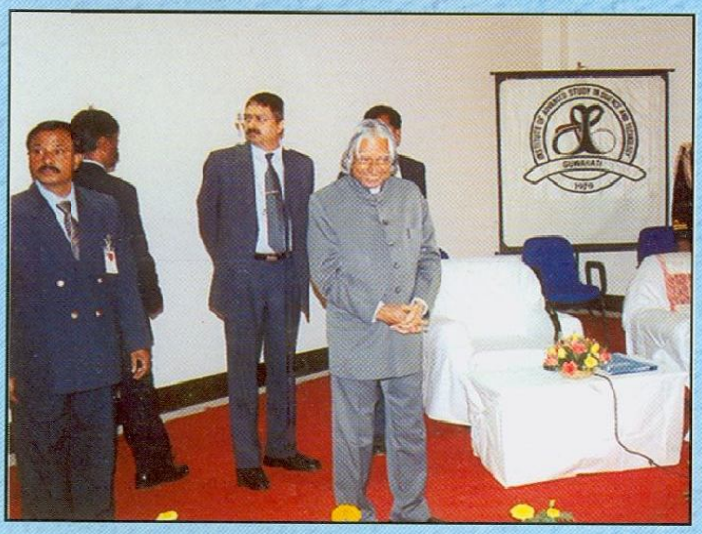
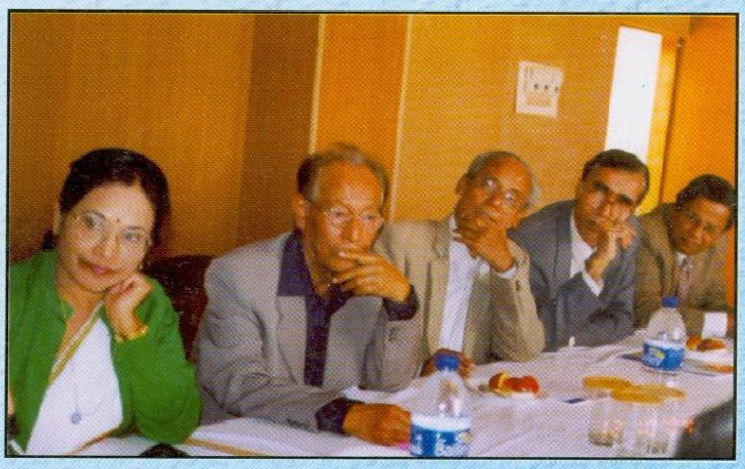
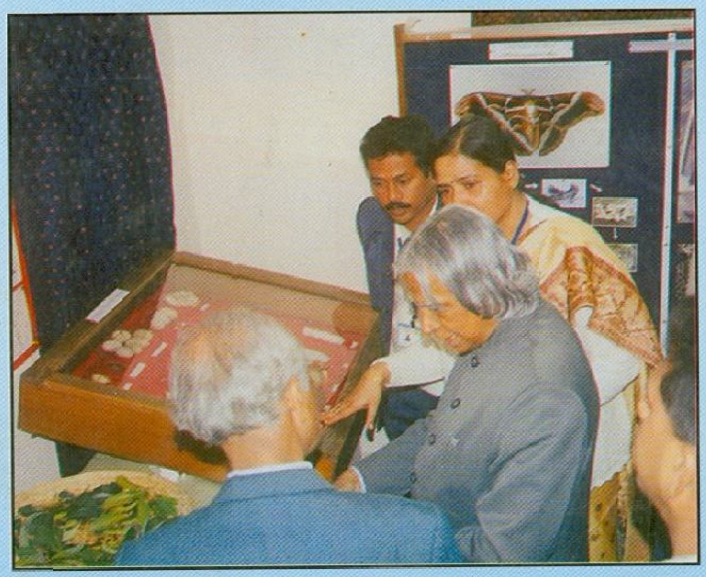
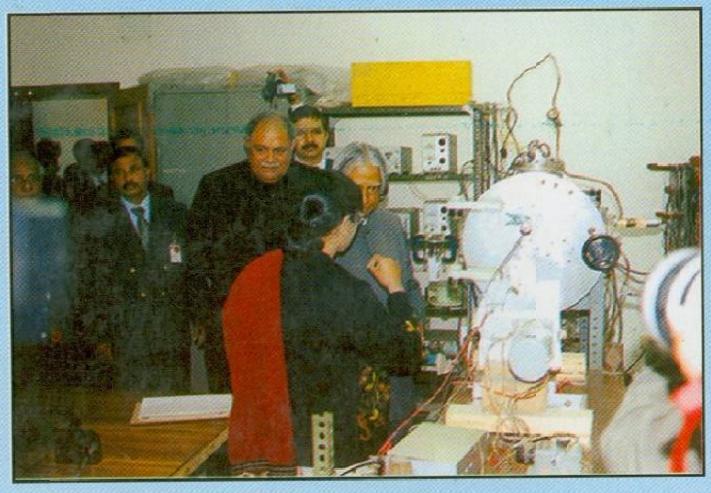


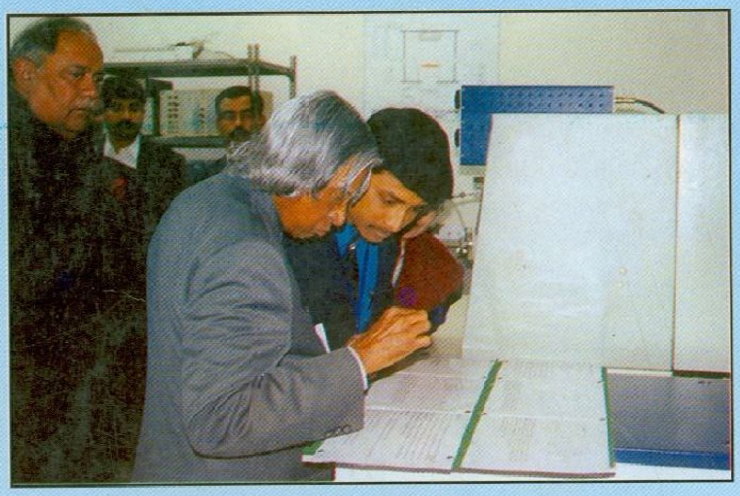
Dr. APJ Abdul Kalam, President of India addressing the scientists at IASST



Preparing for the Presidents Visit







Dr. APJ Abdul Kalam, President of India at the IASST