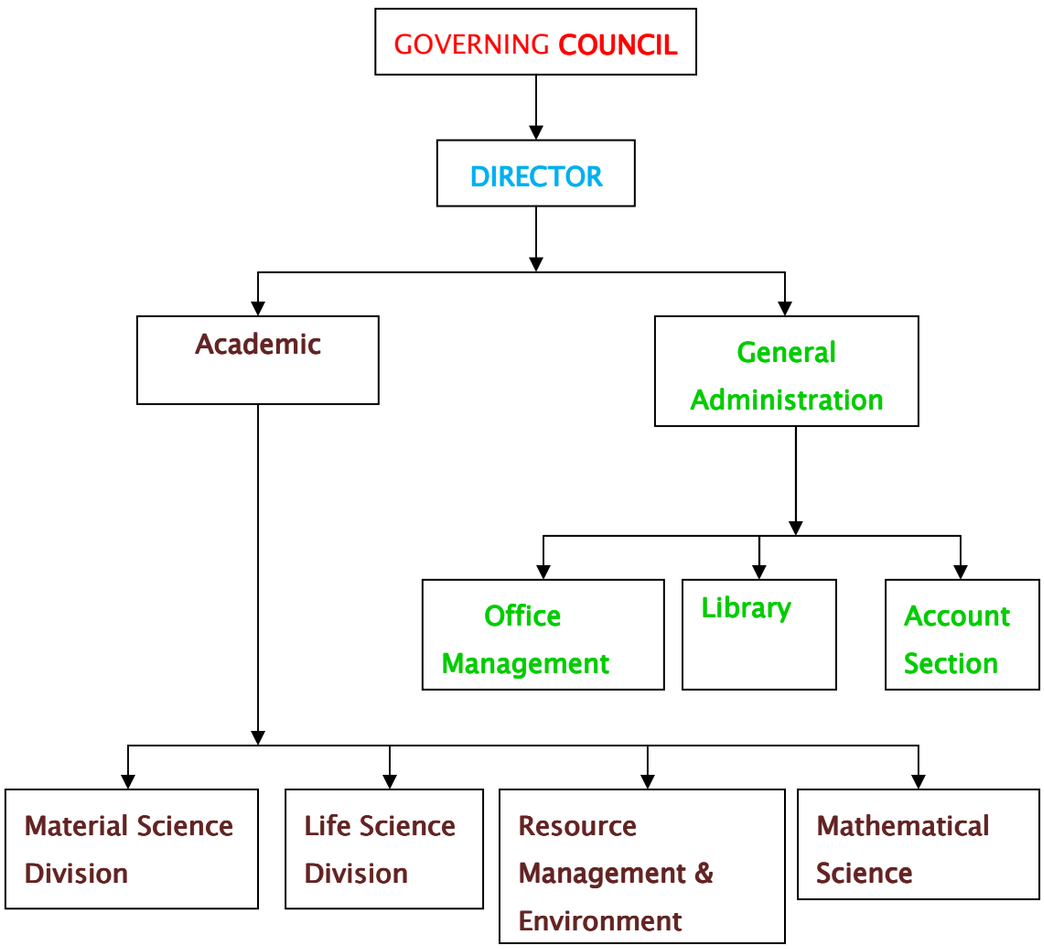
ORGANISATIONAL SET UP



Annual Report

2009–10

Institute of Advanced Study in Science and Technology

(An Autonomous Institute under The Department of Science & Technology, Govt. of India)

Vigyan Path, Paschim Boragaon, Garchuk

GUWAHATI, Assam, India

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Governing Council of IASST

1. Dr. T. Ramasami Secretary, DST, GoI	Chairman.
2. Prof. Sibaji Raha Director, Bose Institute, Kolkata	Member
3. Prof. A.N. Rai Vice-Chancellor, Central University Aizwal	Member
4. Prof. O.K Medhi Vice-Chancellor, Gauhati University Guwahati	Member
5. Prof. R.N. Pal Saha Institute of Nuclear Physics Kolkata	Member
6. Mr. K.P. Pandian Joint Secretary & Financial Adviser DST, GoI	Member
7. Mr. N. Verma Secretary to the Government of Assam Dept. of Science & Technology, Guwahati	Member
8. Prof. (Ms.) Joyanti Chutia Director, IASST, Guwahati	Member Secretary

Foreword

It gives me great pleasure in presenting the Annual Report of the Institute of Advanced Study in Science and Technology (IASST) for the year 2009-2010. The last year is a wonderful year which saw remarkable development of the Institute. Having taken over by the Department of Science & Technology (DST), Government of India, the Institute is now marching steadily and confidently towards its goal in terms of research and development for making the institute a Centre of Excellence.

During 2009-2010, the Institute received Rupees Seven Crore from the Department of Science & Technology (GOI). Over and above this, 25 research projects funded by BRNS, ISRO, DBT, CSIR, DST etc. are being carried out by the scientists in different divisions. This year, we have given priority to the development of infrastructure, library and research facilities.

Adequate financial support to gear up the research activities in thrust areas is required and induction of young talents to provide the push that the Institute needs to carry on. We are introducing advanced instrumentation facilities to the scientific staff phase wise. Equipped with state of the art laboratory tools, the scientists shall be able to work on high quality research. Various schemes, Pre-PhD course, Graduate and Post graduate trainings are introduced. Three major research projects will be soon submitted to the Department of Science & Technology for funding in the next year.

I would like to briefly highlight the significant activities in various divisions over the last year.

Dust ion acoustic waves in multicomponent plasmas with negative ion species show some interesting characteristics that have been observed for the first time. Low density and low temperature plasma produced by magnetic filter, is being used for production of electron free (negative ion - positive ion) plasma and for possible lower earth orbit simulation. RF plasma polymerization process for surface modification of bell metal is an effective technique for depositing hydrophobic and thermally stable polystyrene and hexamethyldisiloxane films. Organic – Inorganic nanocomposite thin films by plasma based technique are developed for device fabrication of solar cell, sensors etc.

Liquid crystalline polycholesteryl acrylate was synthesized and characterized, which shows good thermal properties. Polycholesteryl pentenoate and co-polycholesteryl pentenoate with n-hexene

polymer synthesized in these laboratories exhibit unique conductivity properties suitable for development of thermal switch and thermistor.

Modified polymer nanowires are synthesized and investigations show that it can be used for chemical sensors.

Phytochemical, pharmacological, microbiological evaluations show that some local plants /fruits have phytotherapeutic effects along with antioxidant properties. Study of anti-dermatophytic properties of some local medicinal plants is also carried on successfully. The cause of Pebrine diseases of muga (*Antheraea assamensis*) silkworm has been studied. Some important bands associated to the protein backbone side chains in silk have been assigned. This opens up a noval field of research.

In the investigation for aquatic biodiversity existing in the wetlands of Assam, 115 species are recorded including two *new* fishes from the Brahmaputra drainage. A technique of phyto-assisted bioremediation has been standardized at the IASST to be used in oil fields of Assam for reducing Hydrocarbon contamination. This is a major lab to field application, developed in the institute. Screening of efficient surfactant producing strains of bacteria is also under investigation to be used in oil fields to check pollution.

Studies of types of Difference Sequences, Applied stochastic process and image processing for cervical cancer diagnostics and prognosis are going on. Theoretical problems related to plasmas in astrophysics are another study which is in progress.

The financial position of the Institute improved significantly from its worrisome condition till the year 2009. We are now greatly relieved of such financial trauma and hope hay time would continue. The generous support of the **Department of Science and Technology,** Government of India is gratefully acknowledged.

Date: 17- 06- 2010.

Joyanti Chutia
Director, IASST

OBSERVATION OF FOUNDATION DAY

The 31st Foundation day of IASST was celebrated on 3rd November, 2009 with a day long programme. The auspicious day began with the hoisting of the Institute's flag by Prof. Joyanti Chutia, Director, IASST. It was followed by plantation in the campus. Wide varieties of plants were planted by all the employees of the Institute within the campus.

Flag Hoisting

Plantation of trees

A meeting was held in the afternoon, with Prof. A.K. Goswami, former Principal of Cotton College, Guwahati in the chair. Prof Joyanti Chutia, Director, IASST welcomed the guests and dignitaries. Prof. J. Medhi as Special Guest, Prof K.P. Gopinathan as Chief Guest and Prof. N.N. Dass were present in the meeting.

Lightning of the lamp

Prof. J. Medhi, Professor Emeritus, Gauhati University, formerly Visiting Professor, University of Toronto, University of Montreal, McMaster University, Canada & University of Wisconsin, U.S.A. was felicitated on this special occasion for his research contributions in the field of stochastic processes and systems, developed theory of convexity and stochastic

Felicitation of Prof. J. Medhi

submodularity. He wrote few internationally reputed books e.g. "Stochastic Models in Queuing Theory", "Stochastic Processes" etc.

Prof. Medhi was also honoured with the 1st Dr. K.K. Handique National Teacher Award in 2008. A biography of Prof. J. Medhi written by Prof. Chandra Kanta Chetia of Dibrugarh University was published by DST (GoI) in 2007. The Institute gratefully remembered his contribution towards the development of the Institute from its very inception.

Dignitaries at the dais

In his foundation day lecture, Dr. Anil Kr. Goswami gave a brief history of the IASST since its establishment. The institute was born out of the concept, developed by the Assam Science Society in 1950's. At his initiative as the then Secretary of the Society, Nobel Laureate Dortothy C. Hodgkin came to Guwahati and formally inaugurated the IASST on November 3, 1979. The institute was registered under the Societies Registration act as an independent autonomous organization in 1991.

Dr. N.N. Dass, the former Director congratulated the present Director and others for being successful to make the IASST a national institute. Tracing the history, Dr Dass expressed gratitude to the Government of Assam for allotting the institute a plot of 20 acres of land free of cost at Paschim Boragaon to set up its own campus. The DST, GoI was kind enough to sanction a sum of Rs 10.65 crore under the scheme "Upgrading the IASST" in order to generate the infrastructure for research including construction of academic building, purchase of sophisticated equipments and making the approach road. The project was successfully completed within the stipulated time and the institute was shifted to the present site in 2004. Dr. APJ Abdul Kalam, His Excellency, the then honorable President of India visited the institute on the 30th December 2004 and advised the scientists to carry out research in the fields like nano, bio and material sciences. Dr. Dass advised the scientists of the IASST to work hard to raise the standard of research of the institute to that of international level.

Chief Guest Prof K.P. Gopinathan

The key-note address titled ‘Human Cloning: Ethics and Therapeutic prospects’ was delivered by Prof Gopinathan, Emeritus Professor from IISc, Banglore. The theme of the talk was about human cloning, stem cells and its therapeutic uses. It emphasized on stem cells which are highly proliferative cells and can be differentiated into any type of tissues. The talk was highly informative and beneficial to all the scientists and research scholars present.

The meeting ended with a vote of thanks by Dr. Dipali Devi.

CELEBRATION OF HINDI DIVAS

14th September of every year has been celebrated as "Hindi Divas" in our country. IASST celebrated the occasion by holding a half-day long programme. Dr. Achyut Sarma, Head, Department of Hindi, Gauhati University graced the occasion as Chief Guest.

Dignitaries at the dais

The programme was presided over by Professor Joyanti Chutia, Director, IASST. The function started with a patriotic song by Miss. Bhavana Sarma.

Presidential address from Director

In his welcome address Dr. B.C. Tripathy talked about the role and importance of the Hindi language as national language. He also stressed to use Hindi in all official works.

Dr. Achyut Sarma giving his speech

Dr. Achyut Sarma in his speech said "As a citizen of independent India, we sing national anthem with pride, we salute the national flag and follow the rules of the constitution. Similarly it is our duty to respect our national language Hindi and to use it in daily life is our duty." He quoted an instance from the history of our country and said Swami Dayananda Sarswati ji learnt Hindi at the age of 48 when Keshab Chandra Sen, founder of Arya Samaj, suggested him to do so. Swami Dayananda Saraswati ji after learning Hindi not only delivered speeches in Hindi but also wrote a book titled "Satyarthaprakash" in Hindi.

View of the audience

The songs in Hindi were sung and recitals were performed by the postgraduate students of the Department of Hindi, Gauhati University to celebrate the occasion.

PG student of GU presenting Hindi songs and recitals

Professor Joyanti Chutia in her presidential address said, “We are living in a county which is full of diversity. The students sitting on a bench in a class room have different mother tongues but their national language is same. Today even though English language is at the top but a civilized nation never forgets its national language”. She said, “If we neglect our national language, then our civilization, culture will be in great danger. The negligence to the national language indicates the weakness of our existence”.

Vote of thanks

The meeting ended with a vote of thanks from Dr. S. Deka.

Research Activities

1. Material Sciences Division

Material Sciences Division of IASST has been engaged in frontline research in two areas namely plasma science and technology and polymer science. In plasma physics laboratory of the Material Sciences Division, research in few thrust areas of basic plasmas and industrial application of plasma are being conducted. In polymer section, Material Nanochemistry group is working on nanomaterials of metals, semiconductors, inorganic, organic, polymer, polymer composites and hybrid materials. The aim is to develop a comprehensive chemical methodology leading to a systematic bottom-up fabrication of nanoscale electronic devices.

1.1 Plasma Physics

In the basic plasma unit research work on the understanding of the physics of different kinds of plasmas has been done. Research work on sheath phenomena in magnetized and unmagnetised plasmas, waves and instabilities, chaotic phenomena unfolds some very interesting physics. Dust ion-acoustic waves in presence of additional negative ion species show some interesting characteristics that have been observed for the first time. Low density and low temperature plasma produced by magnetic filter, is being used for production of electron free (negative ion-positive ion) plasma and for possible lower earth orbit simulation. In plasma processing, our aim is to utilize plasma technology in protective and decorative coatings as well as in the development of nano-scale electronic devices.

1.1.1 Observation of Large amplitude compressive ion acoustic waves in multicomponent plasma

Large amplitude compressive ion acoustic solitary waves have been excited in a multicomponent plasma with negative ion density ratio r ~ 0.20 higher than a critical value (~0.102). The experiment is carried out in a double plasma device. A positive initial pulse evolves into compressive solitary waves when the wave amplitude is higher than a threshold value ($\delta n/n$ ~ 0.55). With the increase in excitation amplitude, large amplitude pulse gets amplified and becomes supersonic. The measured velocity and width of the large amplitude solitary waves are found to agree with the prediction of the pseudopotential method when r = 0.20.

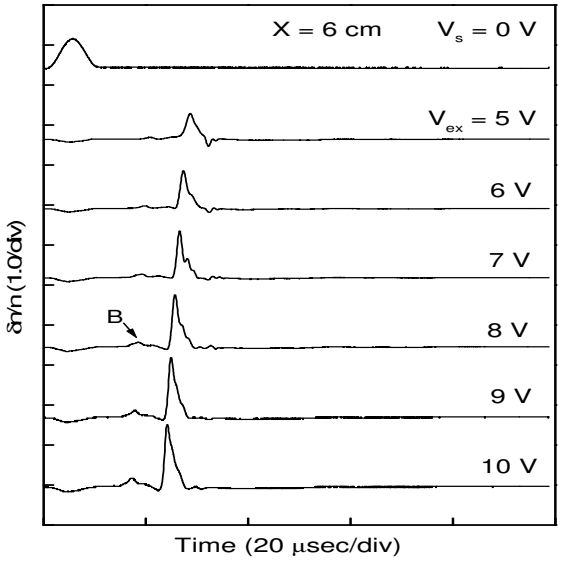


Fig. 1.1.1 Detected signals at X = 6 cm from the grid for different amplitudes of the positive applied pulse (V_{ex}) in multicomponent plasma in absence of ion beam. Measured negative ion density ratio is ~ 0.42.

1.1.2 Interaction of large amplitude compressive solitary wave with positive ion beam

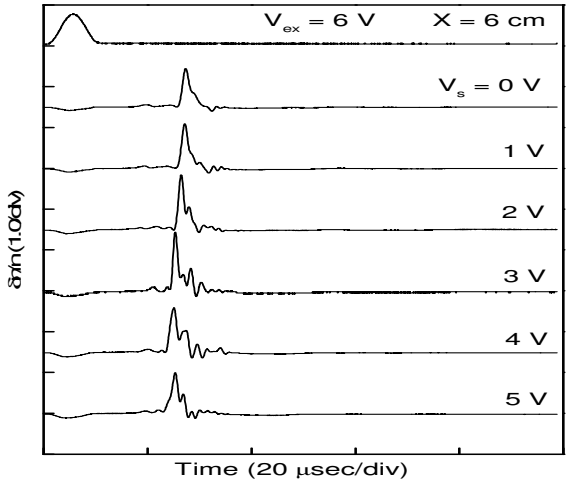


Fig. 1.1.2 Detected signals at X = 6 cm from the grid for a positive applied pulse (V_{ex} ~ 6V) for different ion beam energy. Measured negative ion density ratio is ~ 0.42.

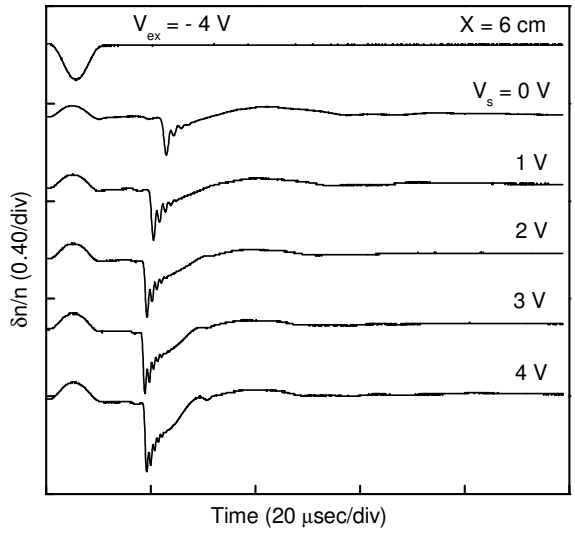


Fig. 1.1.3 Observed signals of wave propagation for an initial pulse V_{ex} = - 4 V at X = 6 cm from the grid in multicomponent plasma (r = N_-/N_T ~ 0.36) for different ion beam energy controlled by the source bias voltages (V_s). Top trace represents the applied pulse.

Interaction of large amplitude ion acoustic compressive solitary waves with a positive ion beam has been studied in ion beam multicomponent plasma. A weak ion beam with 0.8 < V_b/C_s < 1.8 (V_b and C_s are beam velocity and ion-acoustic velocity respectively) interacts with the large amplitude compressive solitary pulse and manifests in two ways. Firstly, the amplitude is enhanced and reaches maximum at V_b/C_s ~ 1.4. Secondly, Mach velocity of the large amplitude compressive pulse increases with increasing ion beam velocity.

1.1.3 Interaction of rarefactive ion acoustic solitary wave with positive ion beam

Propagation characteristics of ion-acoustic rarefactive solitons in presence of an ion beam with different velocities have been studied in multicomponent plasma with negative ions. For an ion beam-multicomponent plasma system, the Korteweg de Vries equation reveals that there exists a critical beam velocity below (above) which rarefactive (compressive) soliton can exist. In presence of ion beam the rarefactive solitons are amplified with the increase in beam velocity. The Mach velocity of the rarefactive soliton is found to decrease with increasing beam velocity. The width of the soliton however increases with increase in beam velocity. The measured velocity and width are found to agree with the theoretical results.

1.1.4 Observation of nearly electron free plasma containing only negative ions and positive ions and study of sheath properties in a very low temperature plasma (~ 0.1 eV) under well controlled laboratory condition:

Production of very low temperature (~ 0.1 eV) and low density (10^6 cm^{-3}) plasma and study of dust charging process in such plasma with the effect of external magnetic field have been investigated. Nearly electron free plasma containing only negative ions and positive ions has been produced and study of sheath properties in such plasma under well-controlled laboratory condition has been performed. The following figure reflects the existence of almost electron free plasma since from the Fig. it is observed that the positive ion saturation current is equal to the negative ion saturation current where we found the electron to positive ion density ratio to be 10^{-4}.

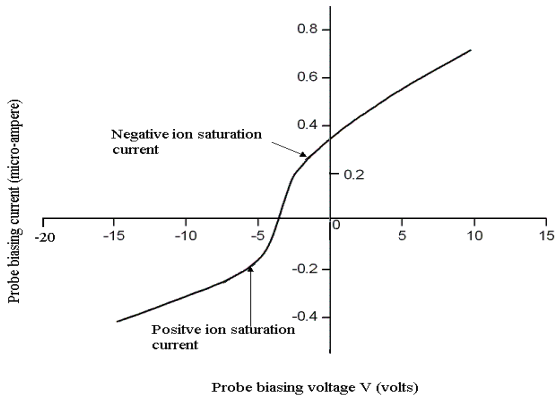


Fig. 1.1.4 I-V characteristics showing the existence of almost electron free plasma

1.1.5 RF plasma polymerization process for surface modification of bell metal:

Research work has been carried out extensively for development of RF plasma polymerization technique for surface modification of bell metal which is commonly used in preparing idols, utensils and other decorative items. The work results in successful deposition of highly adherent, hard and scratch resistant polymer films (polystyrene and hexamethyldisiloxane) on bell metal substrates. Moreover these optically transparent polymer films exhibit stable chemical and thermal behaviors, thereby indicating that RF plasma polymerization can be a convenient and effective technique for surface protection of bell metal. This work also opens up the possibility of improving the export quality of items made of bell metal and also competitive environment among bell metal industries.

Fig. 1.1.5 Virgin and polymer (polystyrene) coated

The RF plasma polymerized films are considered as potential candidates for applications in the field of hard and anti-scratch coatings, optical filters, corrosion resistance layers, gas barriers and humidity sensors. In an ongoing project at the Material Science Division, hydrophobic and thermally stable coatings of polystyrene and hexamethyldisiloxane (HMDSO) films are deposited on bell metal by RF plasma assisted chemical vapor deposition (RF-PACVD) process, using Ar/styrene and Ar/HMDSO/O_2 gas mixtures. The deposition processes are carried out at working pressure of 1.2×10^{-1} mbar and in the RF power range of 20 – 130 W. Raman

spectra analyses of the polystyrene films reveal their high cross-linking chemical structure, while at higher RF power, the plasma polymerized HMDSO (pp-HMDSO) films with less defective chemical structure is observed to be formed (Fig. 1.1.6). X-ray photoelectron spectroscopy (XPS) analyses indicate the increase in carbon content in the polystyrene films in the RF power range of 40 – 100 W. Typical XPS spectra of polystyrene and pp-HMDSO films prepared at RF power of 100 W is shown in Fig. 1.1.7. However at higher power (100 W), there is decrease in carbon content in the polystyrene film thereby signifying more dissociation of methyl groups present in styrene monomer due to dissipation of higher RF power in the plasma. From curve fitting of C1 peak of the XPS spectra of the polystyrene films, it is evident that plasma polymerization of styrene at RF power of 100 W results in formation of highest carbon rich (98.7 %) film. Regarding pp-HMDSO films, the variation of atomic compositions of the films, as observed from XPS analyses, are presented in Table 1. As given in Table 1, increase in RF power yields an increase of oxygen (O_{1s}) content by 9.1 % and that of silicon (Si_{2p}) content by 4.3 % and a considerable decrease of carbon (C_{1s}) content by 13.4 %. The position of Si_{2p} peak is not affected by the variation of RF power and is found to be close to at 103.4 eV, which is a characteristic value of thermal SiO_2. To gain more insight into the chemical composition of pp-HMDSO films, the curve fitting of Si_{2p} peak is performed (Figs. 1.1.8 (a) & 1.1.8 (b)). As observed from Figs. (a) & (b), pp-HMDSO films, deposited at high RF power, exhibit high inorganic character and the film stoichiometry chemically resembles to SiO_2.

Figs. 1.1.9 (a) – (d) show the variation of the shapes and contact angles of water drops on different polystyrene films prepared in the RF power range of 20 – 110 W. It is observed from Figs.1.1.9 (a) – (d) that the polystyrene films show good hydrophobic behavior in the RF power range of 20 – 80 W while at 110W, the film becomes hydrophilic in nature. The water contact angles of pp-HMDSO films are observed to be increased from 95 to 120^0 with RF power. The thermal stability of polystyrene films is studied using thermogravimetric analyses (TGA). The films are heated in N_2 atmosphere at 10^0 C/min over a temperature range of 30 - 750^0 C. Fig. 1.1.10 shows the TGA and differential-TGA thermograms for polystyrene film prepared at RF power of 100 W. The TGA thermogram (Fig. 1.1.10) of the polystyrene film exhibits three steps weight loss. The first step (30 – 195^0 C) arises due to removal of moisture. The appearance of second step (195 – 434^0 C) in the TGA thermogram may be attributed to the weight loss due to aliphatic units while the removal of phenyl units present in the film C contributes to the formation of third step (434 – 675^0 C). The TGA analyses reveal that polystyrene film prepared at RF power of 100 W shows relatively high degradation temperature (T_{on} = 195^0 C) and hence good thermal stability in comparison to the other films (40, 70 and 130 W). The TGA analyses of pp-HMDSO films also indicate three-step weight loss of the films (Fig. 1.1.11). The first step (40 - 185^0 C) is assigned to the weight loss due to moisture. The second step (185 – 394^0 C) may arise due to the removal of organic contents while the third step (394 - 610^0 C) can be attributed to the loss of inorganic contents present in the film. The percentages of total weight loss of the films are

observed to be increased with RF power. It is further seen that the degradation temperatures (T_{on}) of the films prepared at higher RF powers (80 – 100 W) are more than those films prepared in the power range of 20 – 60 W. These findings suggest that RF-PACVD, under optimized deposition conditions, can be an effective technique for depositing hydrophobic and thermally stable polystyrene and HMDSO films on bell metal which is widely used in many commercial applications.

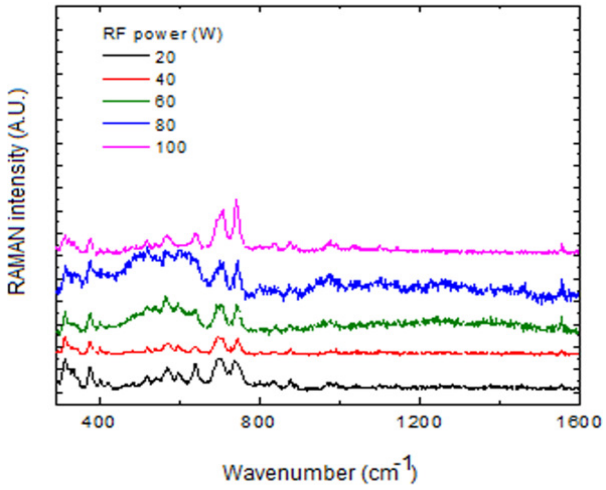


Fig. 1.1.6 RAMAN spectra of the pp-HMDSO films deposited at RF power range of 20 to 100 W.

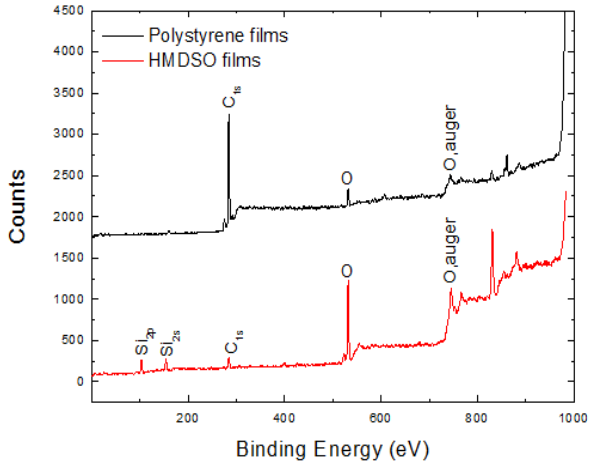


Fig. 1.1.7 XPS spectra of polystyrene and HMDSO films obtained at RF power of 100 W.

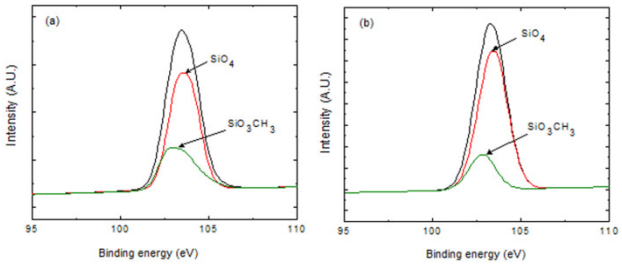


Fig. 1.1.8 Deconvoluted Si_{2p} peaks of pp-HMDSO films deposited at RF powers of **(a)** 20 and **(b)** 100 W.

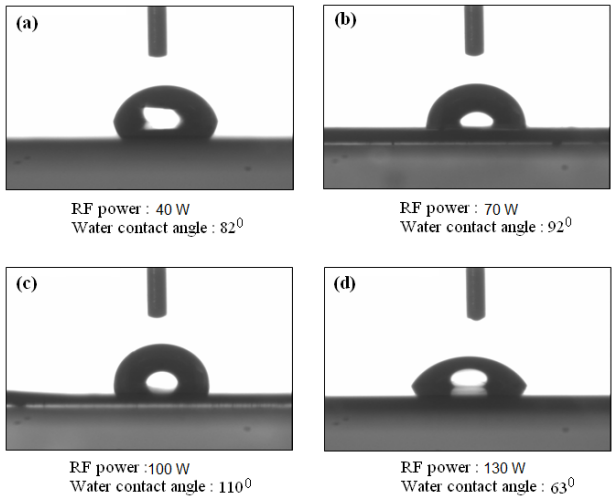


Fig. 1.1.9 Variation of the shapes and contact angles of water drops on the polystyrene films prepared at RF power of (a) 40, (b) 70, (c) 1000 and (d) 130 W.

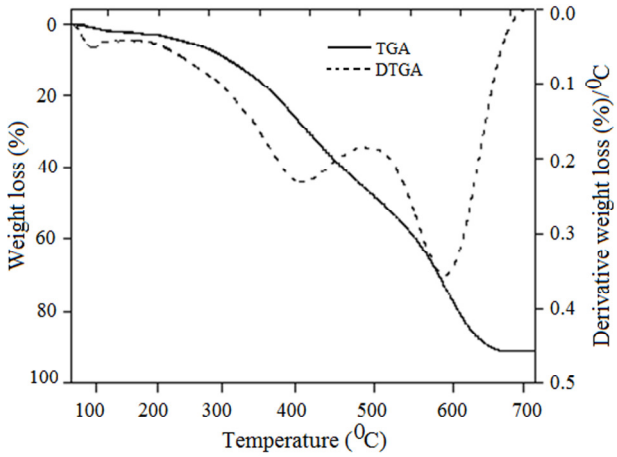


Fig. 1.1.10 TGA and DTGA curves for the thermal decomposition of polystyrene film prepared at RF power of 100 W in N_2 atmosphere (heating rate = 10^0 C/min).

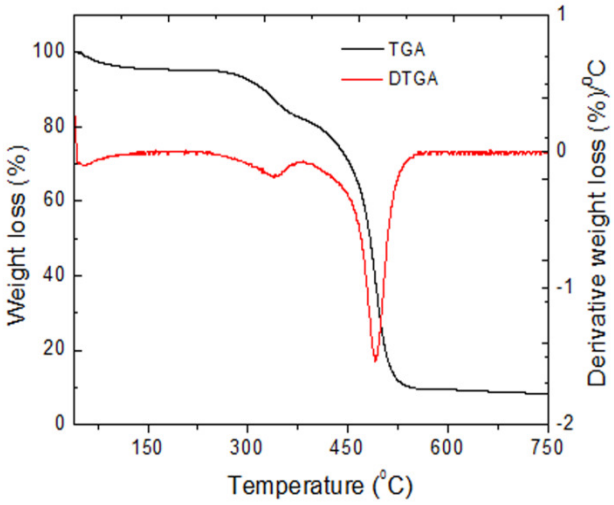


Fig. 1.1.11 TGA and DTGA curve of pp-HMDSO film prepared at RF power of 60 W.

RF power (W)	Atomic composition (%)		
	O	Si	C
20	50.2	24.0	25.8
40	53.1	26.0	20.9
60	55.2	26.8	18.0
80	57.2	27.4	14.9
100	59.3	28.3	12.4

Table 1.1.1 The effect of RF power on atomic composition of pp-HMDSO films.

1.1.6 Synthesis of Organic-Inorganic Nanocomposite thin films by plasma based technique:

An existing RF plasma plasma device has been modified with appropriate design and development of RF electrode and Gas/Monomer supply system for simultaneously achieving the sputtering and plasma polymerization. This system has been utilized for deposition of nanocomposite films of conducting polymer with metal oxides by combined process of reactive magnetron sputtering and plasma polymerization.

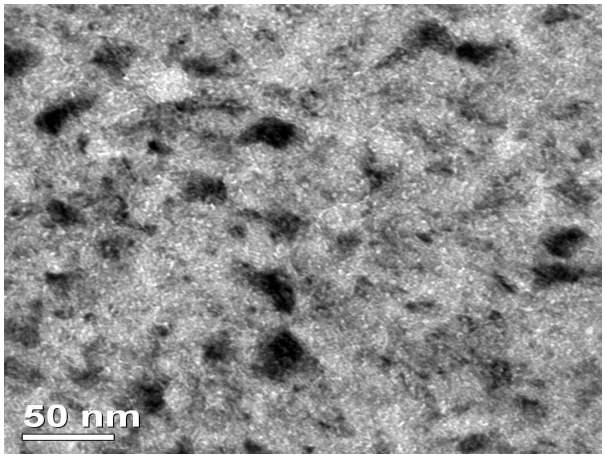


Fig. 1.1.12 TEM image of Polyaniline/TiO_2 nanocomposite thin film deposited by plasma polymerization and magnetron sputtering combined process.

The applicability of PACVD process for synthesis of nanocomposite films of metal oxide / conducting polymer has been investigated. Films have been deposited in a plasma CVD system and plasma parameters have been optimized for achieving the right condition for formation of nanocomposites. TiO_2/Polyaniline nanocomposite films of thickness 300 nm to 500 nm have been deposited under optimized condition with TiO_2 particle size of 3 nm to 5 nm as confirmed from Transmission Electron Microscopy and X-ray diffractometry analysis. The composition of the deposited films has been studied using Fourier transform infrared spectroscopy (FT-IR). The optical properties of the deposited films are characterized with UV-Vis spectroscopy and Ellipsometry measurements. Electrical resistivity measured by four probe technique shows that nanocrystalline TiO_2 / Polyaniline film has a

resistivity significantly lower than plasma prepared Polyaniline. This shows strong potential of application of TiO_2 / Polyaniline nanocomposite film for different types of device fabrication e.g. Solar Cell and Sensors.

1.1.7 Ab initio calculations of vibrational and thermodynamic properties of oxides under pressure

The work is based on vibrational and optical properties of oxides under ambient and high pressure conditions. The computations are based on density functional theory which is an efficient tool to calculate the various materials properties in bulk, surface as well as cluster phases from their electronic structure. The work has also been extended to the pressure induced phase transitions in BeO at zero and finite temperatures. The aim was to focus on the vibrational peroperties of this alkaline earth oxide under pressure to understand the mechanism of phase transitions.

1.1.8 Optical properties of Ga_2O_3 in its post corundum phases.

The increasing importance in the study of various properties of gallium oxide can be attributed to its diverging applications in a number of technologically important fields. The most stable phase of this oxide at room temperature is the monoclinic phase. With increasing pressure the oxide gradually transforms into four different phases. The first high pressure phase is corundum in structure. Present investigation is on the pressure induced phase transitions from corundum to post corundum phases within density functional theory using full-potential linearized argumented plane wave method and hence perform a systematic calculation to predict the electronic and optical properties of these phases.

1.2 Polymer Section

The polymer section is involved in synthesizing and studying the properties of high value polymer, polymer nanocomposites and polymer nanowires. During the last one year number of liquid crystalline (LC) polymer were synthesized and a proto type thermistor device has been developed for demonstration.

Fig. 1.2.1 Research Scholar working in laboratory.

In the polymer section, the material nanochemistry laboratory is working on nanomaterials of metals, semiconductors, inorganic, organic, polymer, polymer composites and hybrid materials. The aim of the laboratory is to develop a complete and planned chemical methodology using a bottom-up approach for fabrication of nanoscale electronic devices. The route involves using template based methods as well as template-less methods in assembling nanomaterials via surface self-assembly. The protocol used in template based method is using scanning probe microscope (SPM) based nanolithography techniques to fabricate viable nanodevices working as transistors, biosensors and chemical sensors. Some of the highlights of the work being carried out in polymer section are given the below.

1.2.1 Synthesis and characterization of liquid crystalline polycholesteryl acrylate and its co-polymer with normal hexene.

Liquid crystal materials are unique in their properties and have great importance in science and application. As research continues in this field and new applications are developed day by day, liquid crystal plays an important role in modern technology. In this work the synthesis and characterization of poly cholesteryl acrylate (PCHA) and that of polycholesteryl acrylate co-1-hexene (PCHAH) are reported. Acryloyl chloride was synthesized by the interaction of acrylic acid with benzoyl chloride. The mesogenic monomer cholesteryl acrylate (CHA) was then prepared by the esterification of cholesterol with acryloyl chloride. The mesogenic monomer was then polymerized with or without 1-hexene. The homo and co-monomers were polymerized using AIBN as the initiator at 70^{o}C. Several CHA-co1-hexene polymers were prepared using different ratio of monomer feed. The polymers were characterized by IR, ^{1}H-NMR spectra and thermal analysis.

The transition temperature from anisotropic liquid to isotropic liquid at which the liquid crystalline phase appeared from brittle polymer on heating was observed in the hot stage microscope fitted with camera. Both the homo and co-polymer show the liquid crystalline property.

It was observed that polycholesteryl acrylate (PCHA) starts to melt at 116^{o}C and completely melts at 157^{o}C. Followings are snaps of the LC polymer PCHA observed at 115.4^{o}C and 137.8^{o}C.

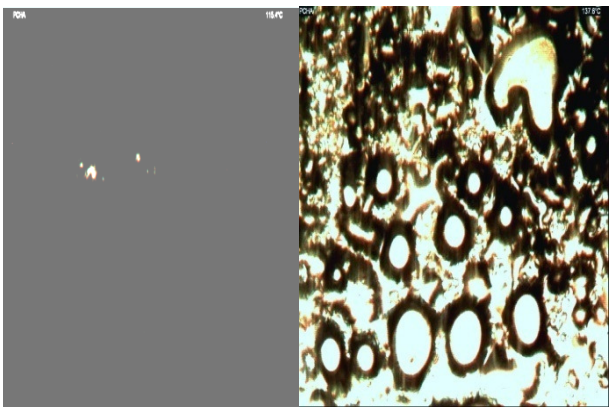


Fig. 1.2.2 Pictures of PCHA under hot stage.

The three co-polymers of cholesteryl acrylate with 1-hexene at different monomer feed ratios were prepared and their liquid crystalline behaviors were observed.

Name of the compounds	Monomer feeds (Mole ratio)	Liquid crystalline range
PCHA	--	116-157°C
PCHAH-1	2:1	134-171°C
PCHAH-2	1:1	95-132°C
PCHAH-3	1:2	131-165°C

Table 1.2.1 Liquid crystalline range of few polymers.

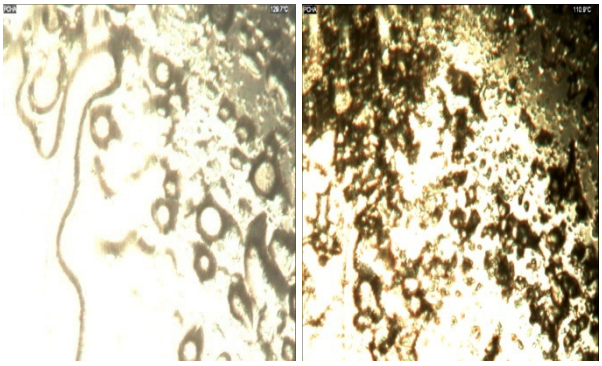


Fig. 1.2.3 Pictures under hot stage microscope of PCHAH-2 at 110.9°C and 129.7°C respectively

From the study it was found that the molecular weights of co-polymers are higher than the polycholesteryl acrylate and with increasing molecular weight of co-polymers their polydispersity decreases. The polymer of cholesteryl acrylate and its co-polymers with 1-hexene as spacer group show good liquid crystalline behaviors at their liquid crystalline temperature. Addition of spacer group (1-hexene) in to the polymeric chain increases their liquid crystalline range and therefore their liquid crystalline temperature can be changed as per requirement using suitable spacer group.

1.2.2 Synthesis and Characterization of poly-cholesteryl 4-pentenoate Liquid Crystalline Polymer and Determination of its Conducting Behaviour.

Objective of this work is to synthesize polycholesteryl pentenoate (PCHPE) and co-polycholesteryl pentenoate with n-hexene (PCHPEH) polymer liquid crystals and characterized them with IR, NMR, GPC etc. methods followed by conduction behavior. 4-pentenoyl chloride was prepared by the distillation of 4-pentenoic acid and benzoyl chloride at their boiling point in a 25cm distilling column. The monomer cholesteryl 4-pentenoate (CHPE) was then prepared by the esterification of cholesterol with 4-pentenoyl chloride. It was then polymerized with or without 1-hexene.

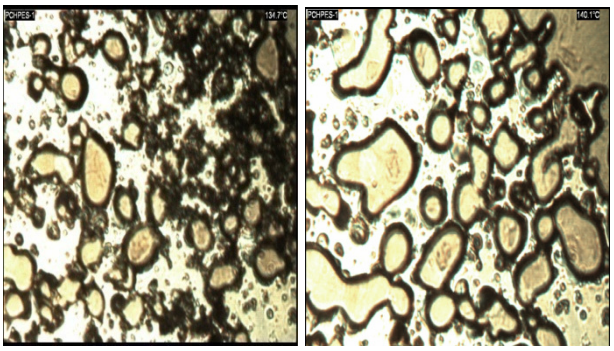


Fig. 1.2.4 Pictures under hot stage microscope of PCHPE at 134.7°C and 141.5°C respectively

It was found that melting starts at around 120°C and completely melts at around 143.5°C.

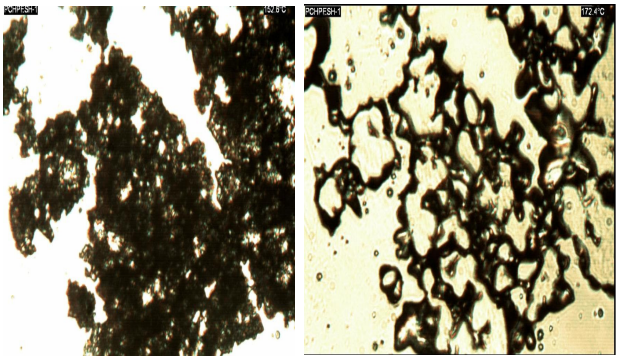


Fig. 1.2.5 Pictures under hot stage microscope of PCHPEH at 152.6°C and 172.4°C respectively

Here, melting starts at around 138°C and completely melts at around 202°C.

Fig. 1.2.6 Laboratory setup for LC polymer study.

I-V Characteristic of PCHPE and PCHPEH**:**

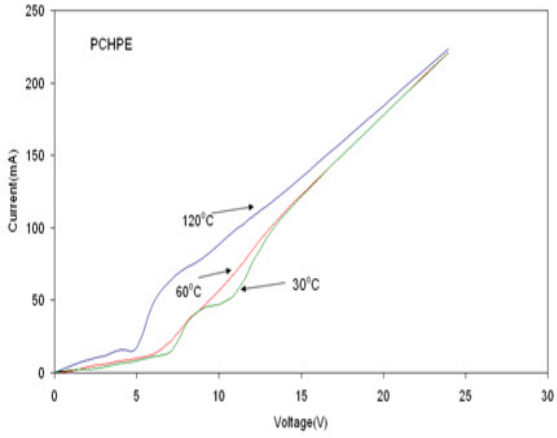


Fig. 1.2.7 I-V characteristic of PCHPE.

It is observed that both PCHPE and PCHPEH show good liquid crystalline behavior in its melting range. Addition of spacer group in to the polymeric chain increase its liquid crystalline range and therefore its liquid crystalline temperature can be machined as per requirement. The breakdown voltage for both the sample starts from around 5volt dc. Conductivity data of these materials show that the materials can be used for making thermal switch, thermistor etc.

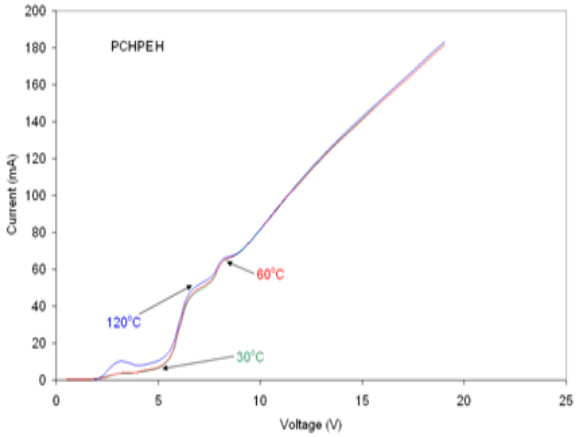


Fig. 1.2.8 I-V characteristic of PCHPEH

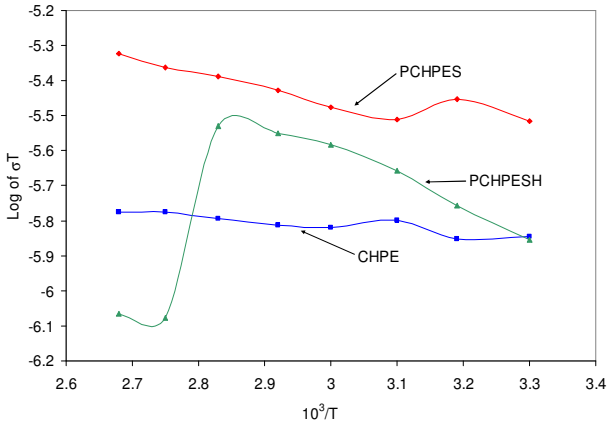


Fig. 1.2.9 vs Conductivity Temperature Curve

1.2.3 Atomic force Microscope (AFM) based tip induced method for nanofabrication self-assembled monolayer (SAM).

The first step for device fabrication is development of patterning technique enabling nanofabrication of template for assembling of nanomaterials. We use atomic force

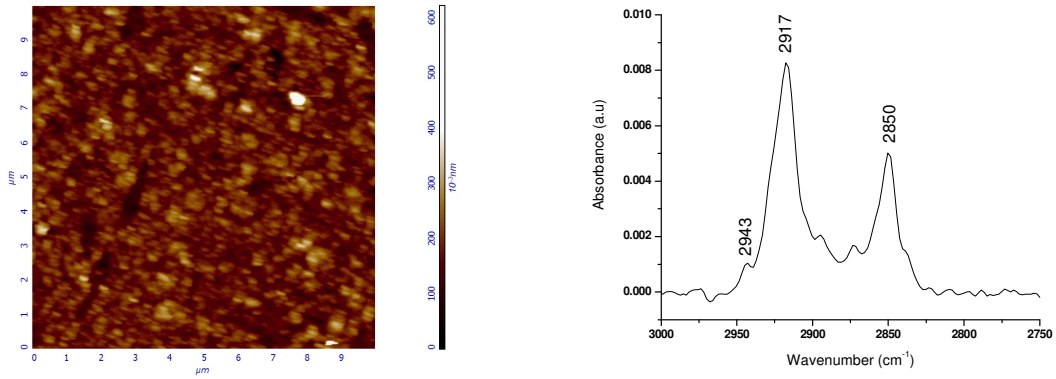


Fig 1.2.10 Atomic Force Microscope image of octadecyltrichlrosilane (OTS) monolayer. FTIR spectrum of OTS monolayer in the spectral region of 2700-3050 cm^{-1}.

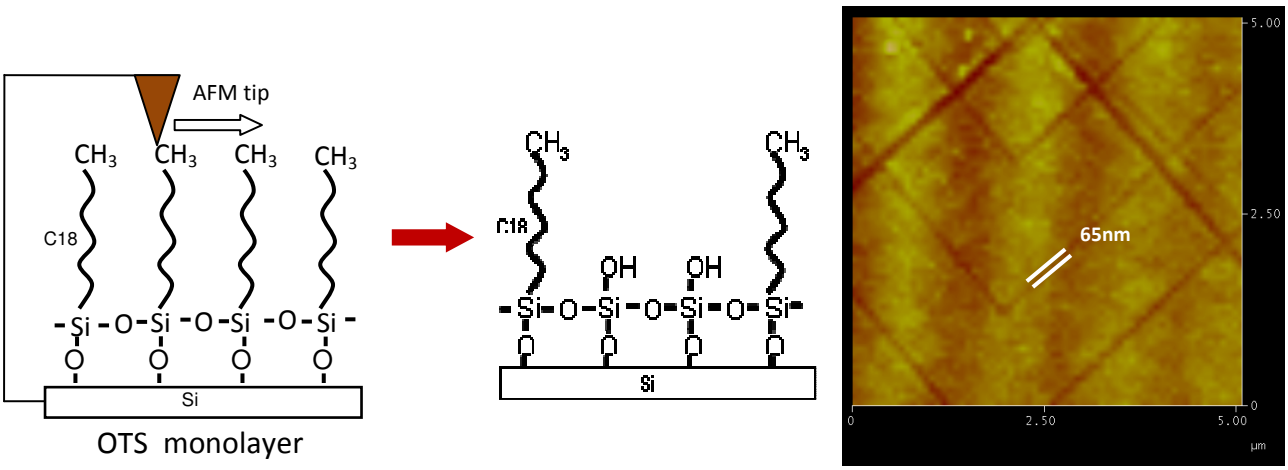


Fig. 1.2.11 Schematic representation of the process of scanning probe microscope induced nanolithography over octadecyltrichlorosilane (OTS) monolayer self-assembled over silicon (left). Representative Atomic force microscope image of tip induced patterning (right).

microscope based nanolithography technique to make template on self-assembled monolayer. Firstly a self-assembled monolayer of octadecyltrichlorosilane (OTS) was assembled on silicon. Atomic Force Microscope (AFM) image of OTS self-assembly is shown in Fig. 1.2.10. A Fourier Transform Infra-red spectroscopy (FTIR) was also recorded of the OTS monolayer. Fig. 1.2.10 shows the FTIR spectrum of the monolayer. The asymmetric and symmetric stretching mode of –H-C-H of methylene group at 2917 cm^{-1} and 2850 cm^{-1} respectively confirms the formation well ordered monolayer. Scanning Probe Microscope tip is used as a tool to selective remove part of the monolayer as shown in schematic representation (Fig. 1.2.11). A representative atomic force microscope image

is shown of the nanolithography done using scanning probe microscope tip (Fig. 1.2.11). The small feature that was successfully made is around ~ 65nm. Work is in progress to use these tip induced patterns to fabricate in assembling of materials for device realization.

1.2.4 Synthesis of modified polymer nanowire and investigating its use as chemical sensor.

Conducting polymers has been the subject of intense study due to its with tunable electrical conductivity and thus find application potential in diverse fields such as microelectronics, displays electrodes (for example, sensors and actuators, membranes for gas separations and solar cells fuel cells. Electrically conducting polymers, termed as "fourth generation of polymeric materials" with their unique redox properties, when doped appropriately, can have electrical conductivity over the full range from insulator to metallic. As a result a large number of synthetic protocols have been developed including incorporation of application-specific functionalization in the polyaniline (PANI) backbone and synthesizing PANI nanofibers, nanotubes, metal nanoparticle–PANI composite, and carbon-nanotube doped PANI. Conductive PANI finds application as chemical sensor. The sensitivity of PANI as sensor can be increased many fold by assembling the polymer molecularly thin in one dimension in the form of wires. The reason of added efficiency is the result of increase of surface active sites in the polymer backbone thus enhancing its performance. Moreover polymer-based nanodevices should have advantages of low cost, flexible, and controlled chemistry on the sensor region.

We at IASST made PANI nanowires and have selectively deposited Ni nanoparticles on the surface of PANI nanowires (Fig. 1.2.12).

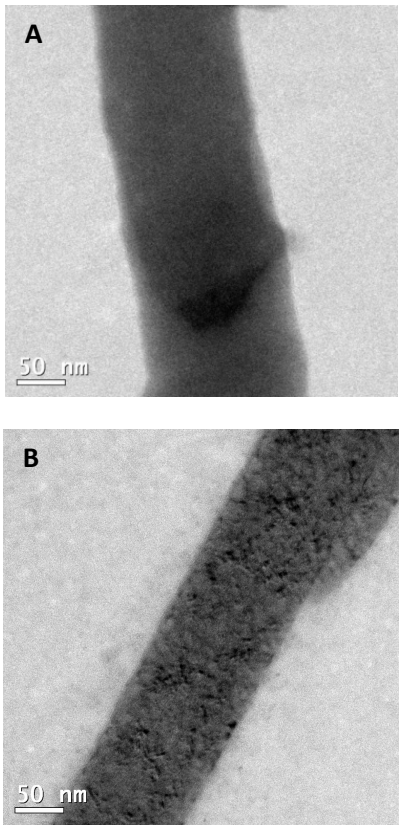


Fig. 1.2.12 TEM image of (A) PANI nanowire and (B) Ni coated PANI nanowire.

The use of PANI-CSA nanowire and Ni coated PANI-CSA nanowire as a.c impedance sensor for detection of cigarette smoke was investigated.

The a.c impedance response in logarithmic scale measured at 42 Hz of bare PANI-CSA and PANI-CSA-Ni nanowire respectively is shown in the figure. The recorded data show that there is increase of impedance of PANI-CSA nanowire after Ni coating on the surface of nanowire by an order.

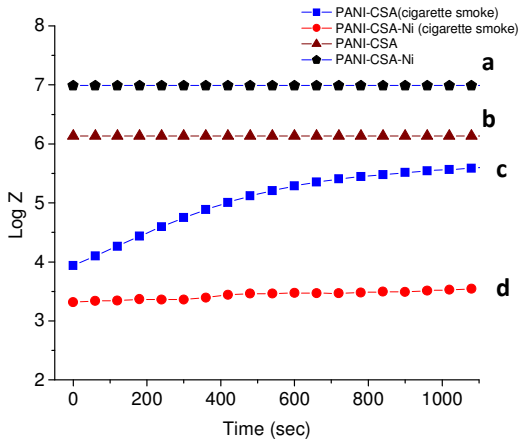


Fig. 1.2.13 Log Impedance (Z) Vs time plot of the PANI-CSA-Ni nanowire after exposure of 2 mins of cigarette smoke. Impedance value is compared with PANI-CSA-Ni nanowire and PANI-CSA nanowire. The impedance was measured at 42 Hz. and at 30° C

The a.c impedance response with time of the PANI-CSA-Ni nanowire and bare PANI-CSA nanowire was also measured after exposure with cigarette smoke. The measured data show four order decrease in the impedance value of PANI-CSA-Ni nanowire on exposure to cigarette smoke (Fig.1.2.13). The a.c impedance response is stable with time. Cigarette smoke contains host of organic gases. When these organic gases absorbs onto PANI-CSA-Ni nanowire, it forms a weakly associated charge transfer complex with Ni as the binding site on the polymer nanowire as a result the mobile charge carrier increases in the system thus decreasing the a.c impedance. Such material has potential application in smoke detector devices.

1.2.5 Carbon nanotube chemoresistors for detection of Arsenic (V) (Done with collaboration at University of Illinois at Urbana-Champaign, USA)

In recent years, chemical sensors based on one-dimensional nanostructures such as bare or functionalized single walled carbon nanotubes (SWNTs), metal oxides, and conducting polymer nanowires have attracted a great deal of attention because of their superior sensing performance. In particular, these sensors offer promising perspectives for real-time monitoring of gases/ vapors, chemicals, solvents with high sensitivity and low-power consumption and potentially at a low cost and their additional small size will also allow future integration with low-power micro/nano electronics. The various operating mechanism for the detection of analytes includes ionization of gases, modulation of optical properties, gas chromatography, mass spectrometry, electrochemistry, conductance modulation in field effect transistors, and chemical resistors. The modulation of the electronic characteristics of a sensor device based on a chemical resistor is a very smart approach because of its simplicity. In pursue to finding novel one dimensional nanomaterials which will not only broaden the range of detected molecules with lower detection limit, single-walled carbon nanotubes (SWNTs) have emerged as a promising candidate in this regard. The mechanism of modulation of the transport properties of SWNTs is usually attributed to charge transfer between the dopant and carbon nanotubes, which is assumed to lead to refilling or depletion of the valence band of the semiconducting SWNTs. Most of the research in the field has been focused on understanding and exploring the sensitivity of the electronic structure of SWNTs to charge transfer from adsorbed molecules. We explore align SWNT/functionalized SWNT

for the detection of arsenic (As^{5+}). The detection and quantification of heavy metal ions are important in many applications, including environmental monitoring, waste management, developmental biology, and clinical toxicology.

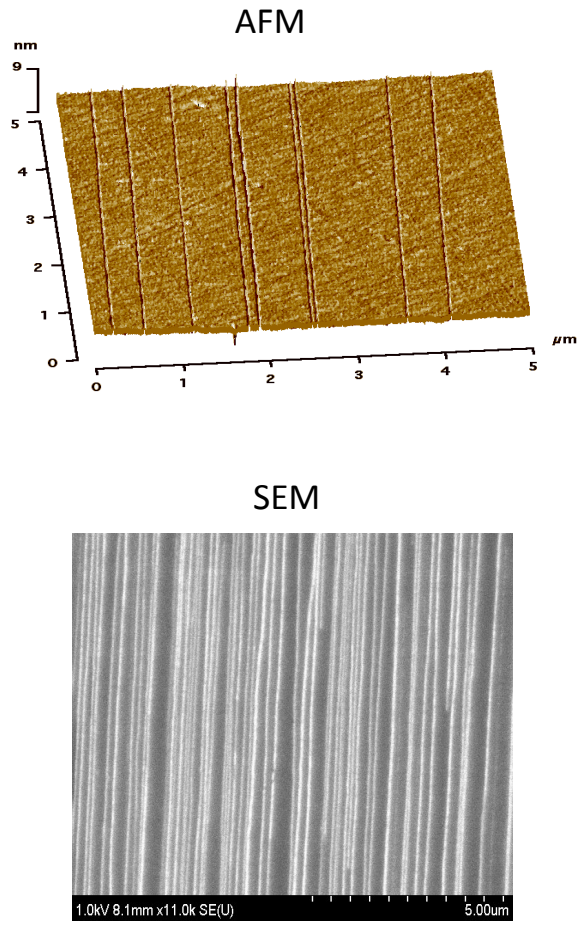


Fig. 1.2.14 Atomic Force microscope image of aligned single walled carbon nanotube Scanning electron microscope image of single walled carbon nanotube.

Align carbon nanotube were prepared on ST cut (stable temperature) quartz wafer. SWNTs were grown by CVD at 925° C for 20 minutes, with a flow of 80 sccms of Ar (Argon) and 30 sccms of H_2 (hydrogen), bubbled through chilled (0° C) ethanol. Iron (Fe) was used as catalyst for the growth CNT. Atomic Force Microscope (AFM) and scanning electron microscope image of the aligned single walled carbon nanotube is shown in figure 1.2.14. To fabricate the chemoresistor device, source and drain electrode was fabricated by photolithography and deposition of Ti/Pd (2.5 nm Ti and 40 nm Pd). Figure 1.2.16 shows the schematic diagram of the carbon nanotube based chemoresistor device configuration fabricated.

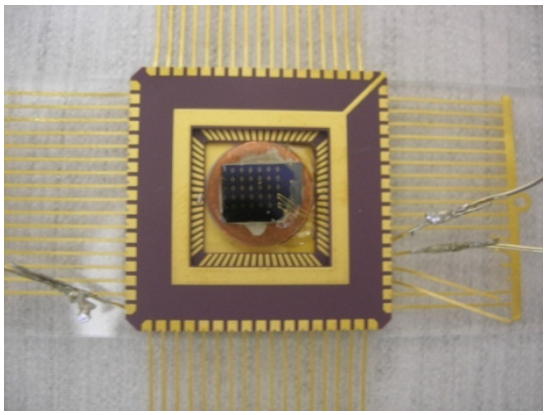


Fig. 1.2.15 Optical microscope image of the carbon nanotube device fabricated.

We carried out experiments to measure the effect of Arsenic (As) on the source-drain current of CNT chemoresistor device. It was observed that the current flow of the SWNT was significantly increased by introduction of As (V). Figure 1.2.16 shows the I-V curve recorded of the device in presence of different concentration of $H_2AsO_4^-$. First around 10 µL droplet of water was placed on a device, and the source-drain current was monitored.

Introduction of 10 ppm of $H_2AsO_4^-$ results in change in the conductance and there is increase of 8.4 % of current in the device. Further adding 50 ppm of $H_2AsO_4^-$ results in

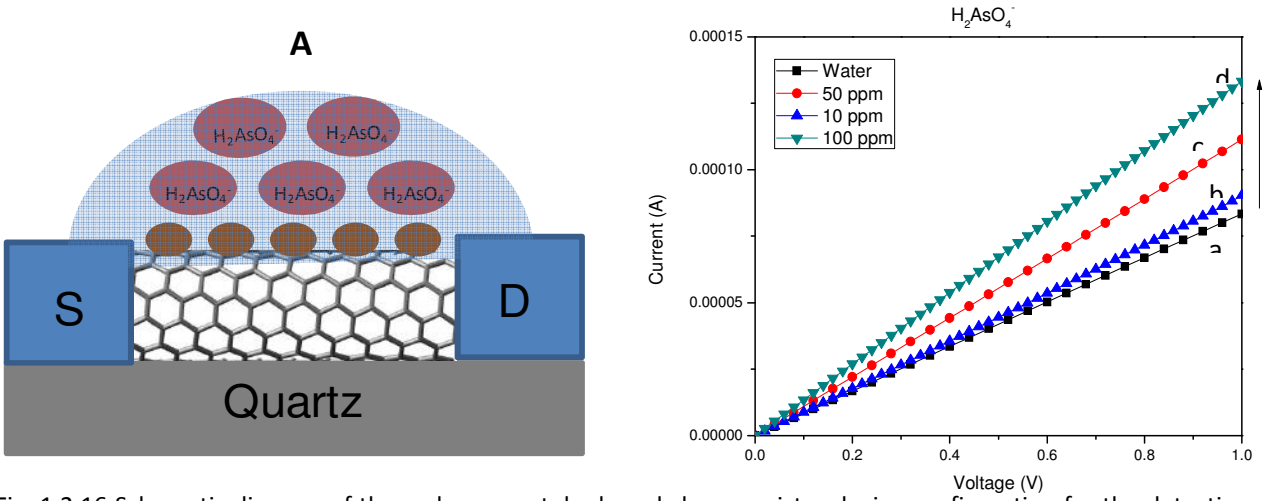


Fig. 1.2.16 Schematic diagram of the carbon nanotube based chemoresistor device configuration for the detection of Arsenic. Current versus voltage curve recorded of the device with different concentration of $H_2AsO_4^-$(a) with water (b) 10ppm (c) 50 ppm (d) 100 ppm.

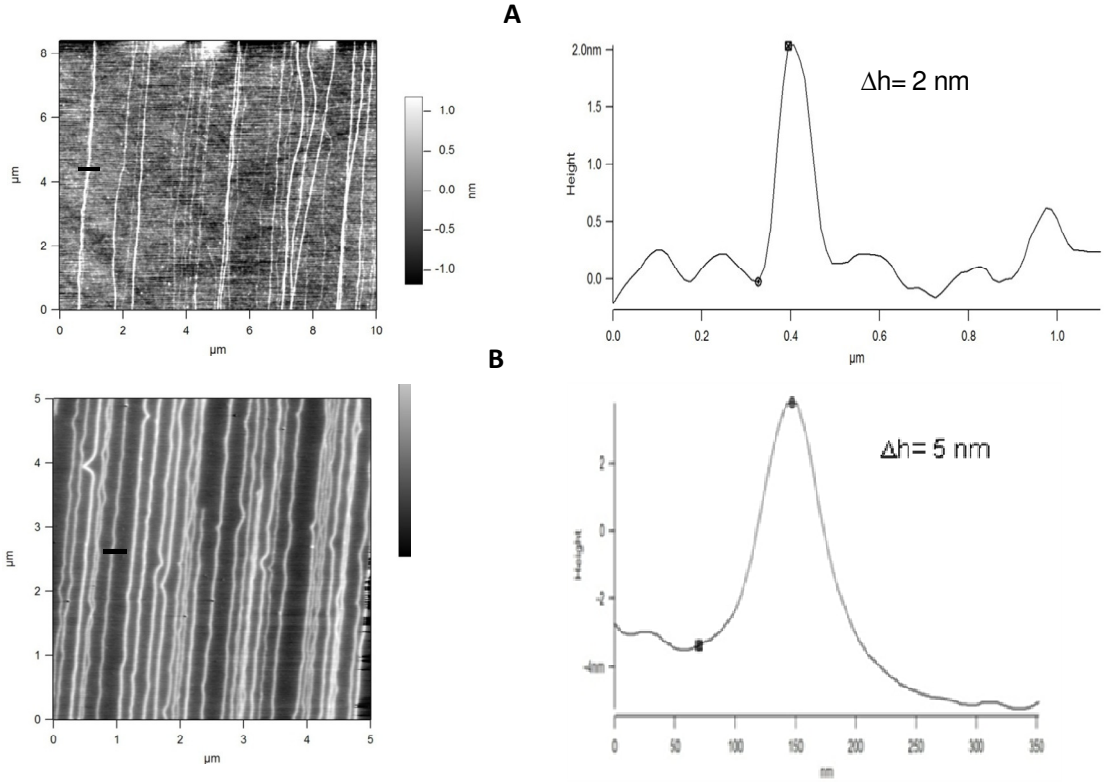


Fig. 1.2.17 Atomic Force microscope image and the corresponding height profile of the tube of (A) align single walled carbon nanotube (B) after putting $H_2AsO_4^-$.

increase in 33.6 % of current value; 100 ppm of $H_2AsO_4^-$ leads to 59.6 % increase of current. The minimum concentration of As (V) detected with the change in current reported was 10ppm below which the change in conductance was not reproducible. These results can be explained by the standard potential difference $\Delta E^0 = E^0_{As\ ion} - E^0_{SWNT}$ between SWNTs and

Arsenic ion. E^0_{SWNT} has value 0.5 – 0.8 V versus NHE depending upon the band gap energy of the SWNT. $E^0As(V) = 0.687$ V

$$H_2AsO_4^- + 6H^+ + 4\,e^- \rightarrow As_2O_3 + 5\ H_2O$$

For the redox reaction between SWNT and As (V) to be thermodynamically favorable $\Delta G = -nFE < 0$. So, we believe as there is increase in the conductance of the SWNT, the E^0_{SWNT} is less than $E^0As(V)$ and $H_2AsO_4^-$ (As(V)) is getting reduced to As_2O_3 (As(III)). As_2O_3 thus formed is deposited on the carbon nanotube. Atomic force microscopy was done both on align carbon nanotubes grown on quartz substrate and after $H_2AsO_4^-$ addition and is presented in figure. The height profile clearly demonstrates that the height of the carbon nanotube increased from 2 nm to 5 nm. Other tubes also show similar increase in height. The increase height can result from the deposition of As_2O_3 onto the tubes. X-ray photospectroscopy (XPS) was also done on the carbon nanotube and is also shown in figure 1.2.18. The binding energy peak at 50.1 corresponds to the As_2O_3 which also confirms the deposition of As_2O_3 on the surface of carbon nanotube.

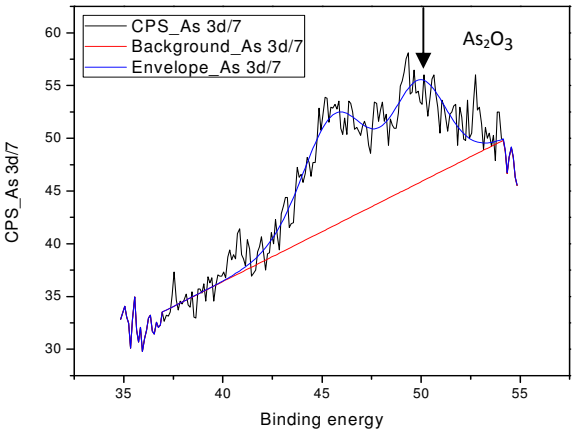


Fig. 1.2.18 X-ray photospectroscopy of the $H_2AsO_4^-$ treated carbon nanotube.

2. Life Sciences Division

The Division is presently concentrating mainly in two important fields – Drug Discovery (Natural Products, Medicinal and Economic plants) and Seri- Biotech.

2.1. Biochemistry and Drug Discovery (Natural Products) section:

The section of Biochemistry and Drug Discovery (Natural Products) is working in the fields of Herbal Drug Research relating to Phyto-chemical, Pharmacological, Microbiological evaluation of different plants/fruits having potential Phyto-therapeutic effects along with studies on their anti-oxidant properties & Phyto-chemical constituents its crystal structure, preparation and standardization of different herbal formulations and their evaluation.

The main objectives of this section presently are to explore in the field of Herbal Drug Research relating to Screening, Isolation. Characterization, Formulation, Evaluation and Standardization, Pharmaco-vigilance and related aspects of Herbal drugs, based on the combined approaches of exploitation and exploration, through Phyto-chemical, Phyto-pharmacological and allied approaches.

2.1.1 Studies on the *in-vitro*, *in-vivo* antifungal property and Toxicity Study of some Medicinal Plants of Assam:

Microbial infections of the skin causing various types of adverse skin diseases are reported since very long. Fungal invasion of human tissue was recognized in the early 1800s. Among the diseases caused by fungal infections: cutaneous mycoses (superficial) caused by the dermatophytes are the most prevalent of all. Dermatophytes are highly specialized group of fungi which during the long process of evolution have developed keratin digesting enzyme systems and have become adopted to invade and thrive on keratinized tissues of humans and animals. Dermatophytes have been classified into three genera viz.- ***Trichophyton, Microsporum,*** and ***Epidermophyton.*** About 40 species of Dermatophytes are known to cause infection in humans and animals.

Dermatophytosis is the most common disease in the tropical and the sub-tropical region of the world, particularly in hot and humid areas like Assam. It poses a serious concern to the sociologically and economically backward common people of North East India in particular and the country as a whole. The infection is not fetal but tends to be chronic and often require prolonged chemotherapy. It is highly contagious and causes instant itching and restlessness that lowers the work performance of the individuals. Though a large number of anti-fungal allopathic drugs are available in the market these are costly and are associated with a large number of adverse side effects like headache, liver damage, contact sensitization etc. Moreover development of resistance toward these synthetic and chemical drugs has emphasized researchers for finding new herbal solution options for the treatment of these diseases.

From historical times many tribes of Assam are using many plants so as to cure a number of diseases including Dermatophytosis, thanks to the knowledge inherited from their fore fathers. More over these plants are cheap, less toxic and easily available but these effective plant base remedies have not been explored scientifically and systematically in these areas. Keeping these points in mind, we have undertaken the study of the anti-dermatophytic property of some medicinal plant, readily available in this area.

Plants Selected: The following plants are selected for the study viz, *Lawsonia innermis*, Solanum *melongena*, Justicia *gendarussa*, *Mimosa pudica*, *Cynodon dactylon*, 68, 79, SG1, SG2. Freshly collected plants and their parts are washed, shade dried and pulverized to fine powder which are then extracted with different solvents like methanol, chloroform, acetone, petroleum ether and water using a soxhlet apparatus and the same is concentrated in a rotary evaporator to get the final extract.

Collection of Fungal strains:

Fungal strains were procured from Institute of Microbial Technology, Chandigarh-160 036 (India). The organisms tested were *Trichophyton rubrum* (MTCC 296), *Tricophyton mentagrophytes* (MTCC-8476), *Microsporum gypseum* (MTCC 4493), *Microsporum fulvum* (MTCC 2837). The procured samples were sub-cultured and are maintained in Sabouraud Dextrose Agar Slants at 4^{O} C.

Table 2.1.1 *In- vitro* results of Mixed extract Final against dermatophytes

Test Fungi	Inhibition Zone (cm) Conc. of extract (µg/ml)							
	C	10,000	5,000	2,500	1,250	625	312.5	156.25
Trichophyton mentagrophytes	0	5.2	4.5	4.0	3.1	2.7	1.9	1.0
Trichophyton rubrum	0	6.2	5.6	4.7	3.8	2.7	1.8	1.2
Trichophyton tonsurance	0	4.9	4.2	3.6	3.0	2.3	1.5	0.9
Microsporum fulvum	0	6.0	5.3	4.8	4.0	2.8	1.9	1.0
Microsporum gypseum	0	6.2	5.6	4.4	3.4	2.9	1.3	0.8

Table 2.1.2 *In- vitro* results of different extracts against *Trichophyton tonsurance*

Extracts	Zone of Inhibition(mm)							
	C	10,000	5,000	2,500	1,250	625	312.5	156.25
68M	0	4.1	3.6	2.7	2.0	1.1	CMD	CMD
79C	0	4.4	3.9	3.1	2.5	1.8	1.1	CMD
SG1	0	4.7	3.5	2.9	2.0	1.3	0.9	CMD
SG2	0	4.9	4.1	3.2	2.6	1.6	1.0	CMD
MEF 1	0	3.9	3.0	2.3	1.7	1.0	CMD	CMD
MEF 2	0	4.1	3.6	2.9	2.2	1.7	0.9	CMD

Table 2.1.3 Minimum Inhibitory Concentration (MIC) of the Plant Extracts

Extracts	*Trichophyton mentagrophytes*	*Trichophyton rubrum*	*Trichophyton tonsurance*	*Microsporum gypseum*	*Microsporum fulvum*
79C	625	312.5	312.5	156.25	625
79M	625	625	312.5	312.5	156.25
68M	312.5	625	625	156.25	625
68C	312.5	625	156.25	312.5	625
68W	2500	2500	2500	2500	2500
SG1M	156.25	312.5	312.5	156.25	625
SG2C	312.5	625	625	312.5	312.5
ME1	625	625	625	1250	625
ME2	1250	2500	625	1250	1250
MEF	625	625	312.5	312.5	156.25
SM(M)	625	625	625	625	625
LI (w)	625	625	>1250	625	1250
JG(M)	>2500	>2500	>2500	>1250	>1250
Clotrimazole	0.090	0.095	0.080	0.080	0.090

C= Chloroform extract, M= Methanol, W= Water Extract

In-vivo results:

Table 2.1.4 In-vivo Results against *Trichophyton mentagrophytes*

Extract name	Concentration of Extract	Time taken for disappearance of Erythema (days)	Time taken for complete growth of hair (days
79(C)	5%	23	45
	10%	19	32
	15%	12	21
SG1	5%	34	50-52
	10%	26	35-37
	15%	18	26
SG2	5%	19	36
	10%	10-11	21
	15%	10	17
MEF	2%	39	52
	5%	27	40-42
	10%	19	33
	15%	12	21-23

Table 2.1.5 In-vivo Results against *Trichophyton rubrum*

Extract name	Concentration of Extract	Time taken for disappearance of Erythema (days)	Time taken for complete growth of hair (days
79(C)	5%	26-27	50
	10%	21	35
	15%	14	28
SG1	5%	36-38	50-52
	10%	26	32-33
	15%	21	23
SG2	5%	23	36
	10%	16-17	25-26
	15%	13	21-23
MEF	2%	30	52
	5%	22-24	34
	10%	17-20	26-27
	15%	10	19-21

Results of Acute Dermal Irritation Test in Rabbit

Table 2.1.6 Primary Skin Irritation and Mucus Membrane Test

Treatment	Erythema (Score)					Oedema (Score)					
	24h	48 h	72h	7d	14d	24h	48 h	72h	7d	14d	24h
79C	0.5	0	0	0	0	0	0	0	0	0	0
68M	0.5	0	0	0	0	0	0	0	0	0	0
SG_2	0.5	0	0	0	0	0	0	0	0	0	0
SG_1	0.5	0	0	0	0	0	0	0	0	0	0
MEF	0.5	0	0	0	0	0	0	0	0	0	0
Control	0	0	0	0	0	0	0	0	0	0	0

***In-vitro* antifungal assay:**

In-vitro antimicrobial screening was carried out by Agar -cup diffusion method (Collins and Lyne 1976. Minimum inhibitory concentrations (MIC) were estimated using two fold serial dilution method (M. S. Ranjith et. al 2005).

***In-vivo* antifungal assay:**

The *in-vivo* antifungal evaluation was carried out by following the Screening techniques for antibacterial and antifungal activity UNESCO-CDRI protocol 1992. *In-vivo* experimental procedures of Khan-Ramon *et. al* 1991 was also followed. The Guinea Pig model was used to test the sensitivity test.

Toxicity Studies:

Extract that showed good results in both *in-vitro* and *in-vivo* experiments are selected for some specific toxicity test both as individual extract and as a mixed extract. The toxicity test includes- Acute Dermal irritation test (Primary irritation test in Rabbit and Mucus Membrane Test in Female Rabbit, OECD Guideline 404, 2002), Guinea Pig Maximization Test in Guinea Pig (OECD Guidelines 406, 1992), LD 50 Test (Handa *et. al.*).

The antifungal activity of the extracts is determined by measuring the diameter of the inhibition zone around the well that is filled with the extracts. The results showed a positive concentration dependent effect that the zone of inhibition increases with increase in extract concentration. Plate showing full growth is termed as CMD (complete mycelial development). The Minimum Inhibitory concentrations of the extracts are also determined which ranges from more than 2.5 mg to as low as 156.25µg/ml.

In each *in- vivo* test animals were grouped as- 1) Treatment group, 2) Positive control group and 3) Negative control group. Guinea pigs infected with different dermatophytes were treated with the extracts with concentrations ranging from 2-10%. The time taken for complete healing is the result of the experiment. Healing signs includes- decrease in erythema, oedema, decrease in the scaling areas and complete recovery of hair in the dermatophytic infected areas. Healing was confirmed when skin scrapings taken from the tested Guinea Pigs yielded no further growth of pathogens on Sabauroud Chloramphenicol Agar plates.

From the *in-vitro* and *in-vivo* experiments carried out we can conclude that most of the extracts we have tested possess strong anti-dermatophytic properties individually as well as when all the extracts are mixed together. Also the Preliminary results of the toxicity test revealed the non toxic nature of the extracts at the required concentration level. Hence they may serve as an alternative anti-dermatophytic agent.

Skin Sensitization Test

Fig.2.1.1 Healthy Adult Guinea Pig after hair clipping

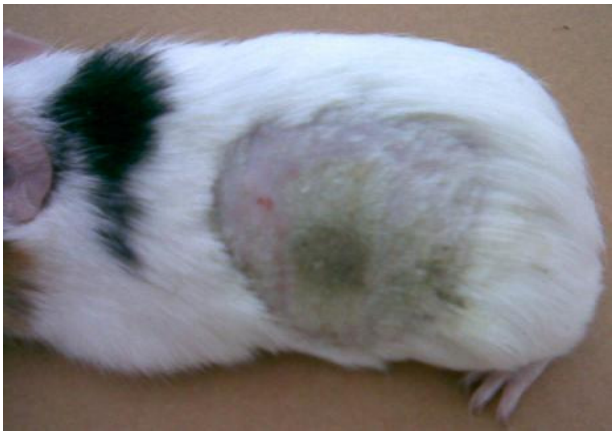


Fig.2.1.4 Guinea Pig after Topical application

Fig.2.1.2 Guinea Pig after Intra dermal injection

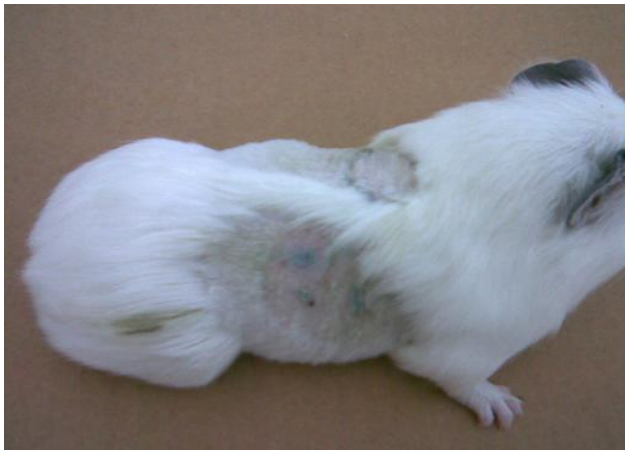
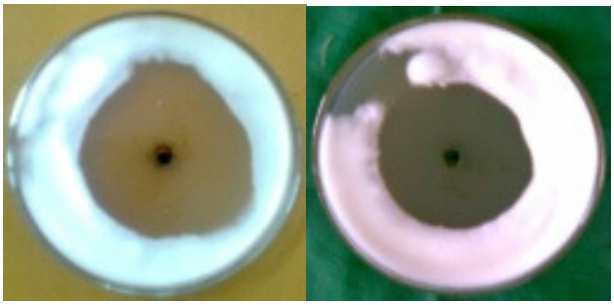


Fig.2.1.5 Guinea Pig after 48 hrs of 30% Intra Dermal MEF Injection

Fig.2.1.3 Topical application in Guinea Pig

Fig.2.1.6 Guinea Pig after 48 hrs of 0.5% Intra Dermal Benzocain injection



5mg/ml 2.5mg/ml

Control

1.25mg/ml 0.625mg/ml

Fig. 2.1.7 *In-vitro* Photographs of MEF against *Microsporum fulvum* at different concentrations

2.1.2 Evaluation of antioxidant activity, phenolics and mineral contents in *Musa balbisiana* –an indigenous fruit of Northeastern Region (NER) of India.

Fruits and vegetables are recognized sources of a number of nutrients that protects health. The protective effect of these natural products is mostly related to their antioxidants: phenolic compounds and to a less extent, dietary fibre. Antioxidants appear to play a major role in the protective effect of plant foods. Oxidative damage caused by free radicals and reactive oxygen species (ROS) may be related to aging and diseases such as arteriosclerosis, diabetes, cancer, cirrhosis etc. The fruits and vegetables are rich sources of natural antioxidants that might serve as leads for the development of novel drugs. The growing interest in the substitution of synthetic food antioxidants by natural antioxidants and in the health implications of antioxidants as nutraceuticals has fostered research on fruit and vegetable sources and the screening of raw materials for identifying antioxidants.

Northeastern Region of India is rich in biodiversity of different indigenous fruits/medicinal plants. *Musa balbisiana* (Local name- Athia kol, F: Musaceae) is one of such important fruits. It is widely used by the people of this region not only as food (both for baby and adult) but also as a home remedy against many diseases viz stomach related diseases, diabetes, skin diseases etc. But due to lack of scientific knowledge this fruit is being ignored by the local people day by day, which have led to extinction of this valuable fruit. So we have made an attempt to explore the pharmacological properties of it and thus to make people aware about medicinal properties and also its commercial importance. We have done the following experiment to determine its pharmacological properties.

***In vitro* experiment**

Free radical scavenging activity

The free radical scavenging activity of MB was determined based on their ability to bleach the stable free radical 1, 1- diphenyl, 2-picrylhydrazyl (DPPH) as described by Brand-Williams *et al*. (1995). The inhibition % of radical scavenging activity was calculated using the following equation.

Inhibition (%) = $[(A_0\text{-}A)/A_0] \times 100$

where A_0 is the absorbance of DPPH in the absence of the sample and A is the absorbance of DPPH in the presence of sample.

Determination of total polyphenol content

Total phenolic content of methanolic crude extracts was determined by Folin & Ciocalteu method (1927).

Determination of mineral content

Mineral content in *Musa balbisiana* were detected in three samples collected from three different places of Kamrup District of Assam, India (*i.e*. Hajo, Sonapur and Azara) to observe the variation of the content in different places. For this 10 gm pulp of fruit was repeatedly digested in concentrated nitric acid until the residue became colourless. After digestion the volume was made up to 100 ml with distilled water. Mineral content were estimated by atomic absorption spectrometer (AAS), (Model: Perkin Elmer 3110).

***In vivo* experiment**

For in vivo experiment we have selected albino rats of both sexes (150–200 g), divided in different groups. Biochemical parameters like thiobarbituric acid reactive substance (TBARS, as a marker of oxidative stress), superoxide dismutase (SOD), Catalase (CAT), Glutathione (GSH) etc were selected for our study.

Significant changes in TBARS (key marker for diagnosis and prognosis of oxidative stress) level both in serum and liver of different groups are shown in figure 2.1.3 and figure 2.1.4 Significant change in liver histology were shown in figure 2.1.5 to 2.1.8. Present study clearly indicated the lowering of oxidative stress and overexpression of antioxidant parameters in hyperlipidaemic rats treated with MB.

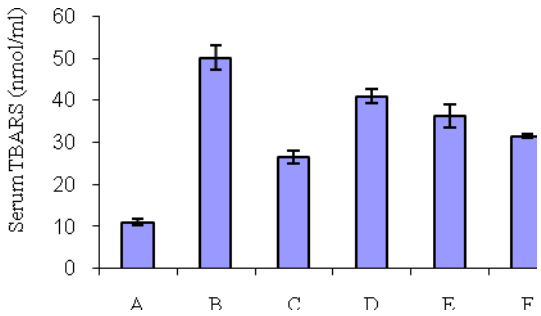


Fig. 2.1.8 Changes in serum thiobarbituric acid reactive substances (TBARS, nmol/ml) level in different groups A=control, B=cholesterol feeding group, C=cholesterol + trolox feeding group, D=cholesterol + 10% Musa balbisiana feeding group, E=cholesterol + 20% Musa balbisiana feeding group, F=cholesterol +40% Musa balbisiana feeding group. Values are mean ± SE. No of observation 6.

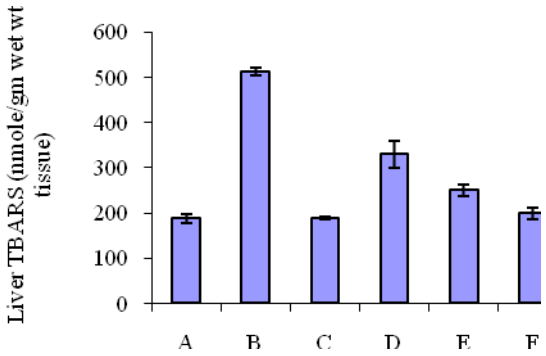


Fig. 2.1.9 Changes liver (nmole per gm wet wt tissue) thiobarbituric acid reactive substances (TBARS) level in different groups A=control, B=cholesterol feeding group, C=cholesterol + trolox feeding group, D= cholesterol + 10% *Musa balbisiana* feeding group, E=cholesterol + 20% *Musa balbisiana* feeding group F=cholesterol 40% *Musa balbisiana* feeding group. Values are mean ± SE. No of observation 6.

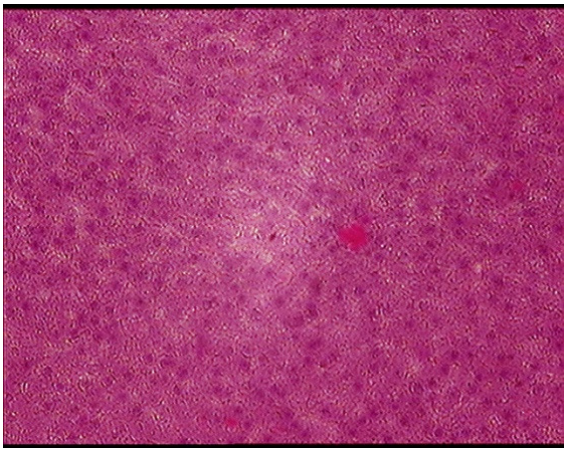


Fig. 2.1.10 Photomicrograph of control rat liver

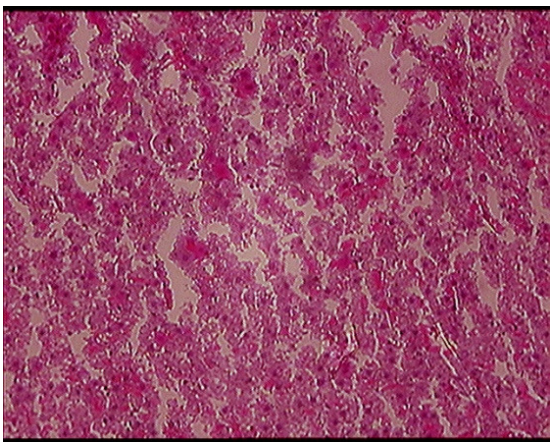


Fig. 2.1.11 Photomicrograph of rat liver treated with Cholesterol (in stress condition)

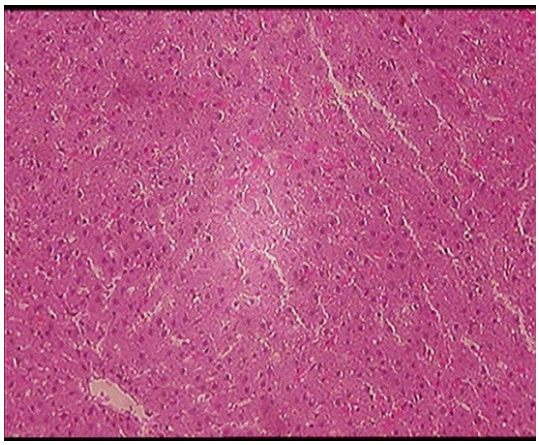


Fig. 2.1.12 Photomicrograph of rat liver treated with cholesterol and 20% pulp of MB

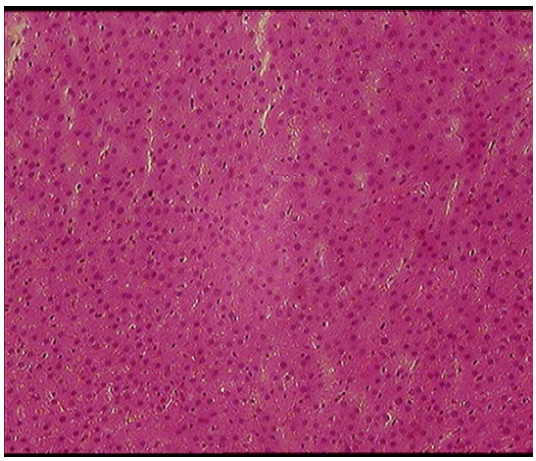


Fig. 2.1.13 Photomicrograph of rat liver treated with cholesterol and 40% pulp of MB

2.2 Seri- Biotech

The origin of silk is mysterious and obscure. Silk and the silk moth is mentioned in the 'Veda' which is regarded as the oldest scripture in the world originated beyond 10,000 years B.C. Mention of silk was also found in other Indian scripture 'Ramayana' (8000 years B.C) and 'Mahabharata'(4000 years B.C). The reference of various types of silk appeared in Kautilayas's Arthsastra (320 B.C) and was regarded as the best among the fibres. With this glorious historical background, India is still in a prestigious position in the global scenario of silk production. Especially North Eastern part of India is known as hotspot area of growing all types of sericigenous insects. Apart from the most commonly cultured commercial four varieties namely, Muga, Tasar, Eri and Mulberry silkworms some other silkworms are also available in wild forms. With the changing environment, the population diversity and density of wild silk moths in natural eco system are declining rapidly. Owing to their ecological implications and potentiality as resources for silk industry, this vast pool of genetic resources must be studied and conserved. Seribiotech unit have collected and preserved various types of silkworm at various forms as shown in the photographs below.

Biodiversity of Silkworm:

Fig. 2.2.1 *Antheraea assamensis*

Fig. 2.2.2 *Antheraea frithi*

Fig. 2.2.3 *Antheraea mylitta*

Fig. 2.2.4 *Attaus atlas*

Fig. 2.2.5 *Philoramia ricini*

Fig. 2.2.6 *Criula trifenestrata*

Fig. 2.2.7 Morphometric study of *Attacus atlas*

Fig. 2.2.10 *Philoramia ricini*

Fig. 2.2.8 *Antheraea Mylitta*

Fig. 2.2.11 *Attaus atlas*

Fig. 2.2.9 *Antheraea frithi*

Fig. 2.2.12 *Cricula trifenestrata*

Fig. 2.2.13 *Antheraea frithi*

Fig. 2.2.14 *Philoramia ricini*

Fig. 2.2.15 *Criula trifenestrata*

Experiment on Muga silkworm:

Changes of carbohydrate, protein and lipid in the developing embryo of *Antheraea assamensis* Helfer under pebrine infestation

Pebrine diseases- Pebrine is a Protojoan microspondia disease transform through mother womb to the newly hatched eggs as a spore forms. Pebrine spore was detected while examining the mother moth under Phase contrast microscope by standard procedure.

Fig. 2.2.16 Pebrine infected larvae of *Antheraea assamensis*

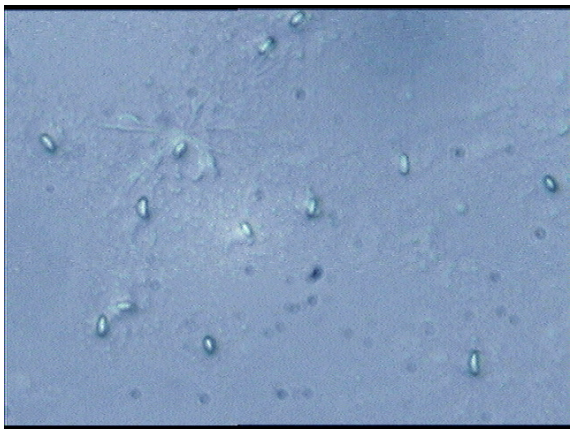


Fig. 2.2.17 Pebrine spores

The changes of carbohydrates concentration of healthy eggs are found significant in two consecutive days of embryonic development. Gradual decrease of carbohydrate from1st days (34.599±1.11mg/gm) till 8th day

(18.146±1.86mg/gm) and a step rise on 6th day (33.411 ±1.72 mg/gm) was noticed.

The same trend was observed in total protein concentration of healthy eggs from 1st day (166.63±1.98 mg/gm) till 8th day (107.058±1.42 mg/gm). As the development of the embryo proceeds 75% of lipid was utilized resulting gradual decrease in its concentration. However, it was noticed that infestation of Pebrine diseases influences the carbohydrate; protein and lipid content as lower concentration have been recorded from 1st day to 8th day. The variation in carbohydrate was found significant, however, only a marginal changes have been recorded in protein concentration. It is indicative that the infestation of Pebrine at embryonic stage is not a fatal agent for embryo but they hatches out as nutrient deficient larvae leading to death in subsequent larval stages.

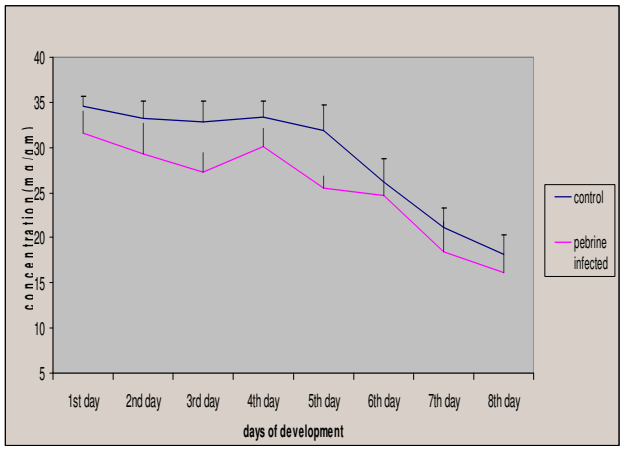


Fig. 2.2.18 Shows changes in the concentration of total carbohydrate (mg/gm) during embryo genesis. The data are average of mean ± SD (n=10).

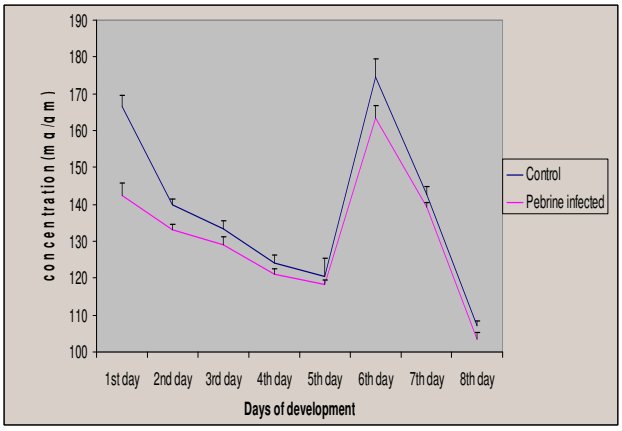


Fig. 2.2.19 Shows changes in the concentration of total protein (mg/gm) during embryogenesis. The data are average of mean ± SD, (n=10).

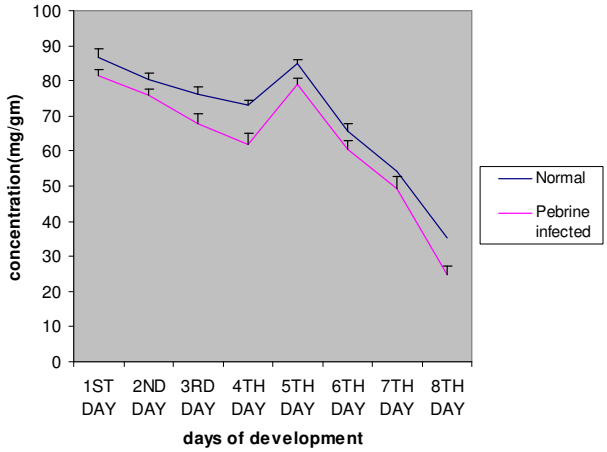


Fig.2.2.20 Shows changes in the concentration of total lipid (mg/gm) during embryogenesis. The data are average of mean ± SD, (n=10).

Cold Storage of Cocoons and Moths and its affect on Fecundity.

Male cocoons and moths were cold stored in BOD incubator at 5°C and allowed to pair normally with untreated female moths. Treated cocoons were taken out of the BOD on the same day on which the female moths emerged, but the treated cocoons emerged on the next day. Percentage of emergence was also very

low (30%) in case of treated cocoons and percentage of pairing was 100%.

Male moths which emerged 2 days prior to the female moths were cold stored at 5^{o}C in a BOD incubator. As the females emerged, they were allowed to pair and we achieved 71.4 % pairing.

Untreated male and female moths were treated as control. In control the emergence was 78.6% and pairing percentage was 46.03%.

Fecundity-

Fecundity was highest in case of the control (175), followed by treated moths (130), and treated cocoons (114).

Hatching Percentage-

92% hatching was found in case of control, followed by 83.21% in treated moth and 52.72% in treated cocoons.

Fig. 2.2.21 Transfer of larvae at outdoor rearing

Fig. 2.2.22 Indoor rearing

Study on fibres

Silk filaments produced by silkworms are nature's most highly engineered structure material and is a combination of strength and toughness that could not be reproduced by artificial means. The exceptional mechanical properties of Silk fibre may seem to be due to its semi crystalline nature made of amorphous flexible chains reinforced by small stiff crystallities (Rousseau *et al.,* 2004). Silks from different species are composed of proteins of particular primary structure i.e. amino acids and are expected to exhibit variability of microstructures and properties. Thus these properties are species specific. Anti-parallel β sheets are very common in proteins because of the possibility of inter conversion of α and β forms.

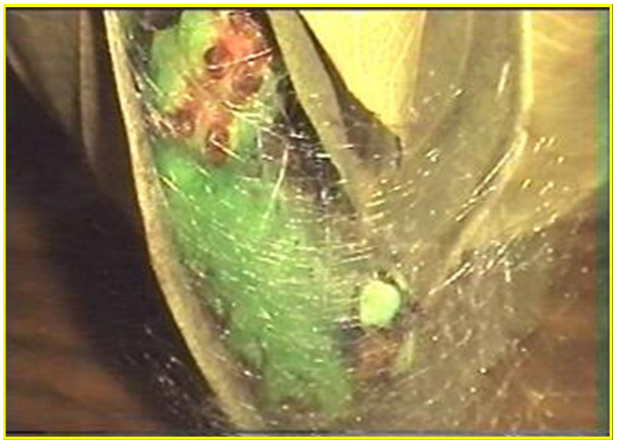


Fig. 2.2.23 Cocoon spinning by larvae

Parameters / Silk filament	Tenacity (g/den)	Strain (%)	Toughness (g/den)	Young's Modulus (g/den)
Muga	4.735	35.05	0.9039	70.64
Tasar	4.280	**31.22**	0.7663	67.57
Mulberry silk	**4.512**	**19.37**	**0.4302**	**82.47**

Table- Parameters on tensile strengths of silk fiber

Infrared spectra for *Bombyx mori, Antheraea assama* and *Antheraea pernyi* recorded in the microscopic method are shown in Figure 2.2.24.

From the result, it is clear that the silk has allowed the assignment of some important bands associated to the protein backbone and side chains.

The peak at 1627cm^{-1} may be due to α and at 1562cm^{-1} may be due to β from energy consideration. The intensity ratio of the peak is roughly 1:1. This ratio may vary from sample to sample because α and β phase undergoes inter-conversion due to stress.

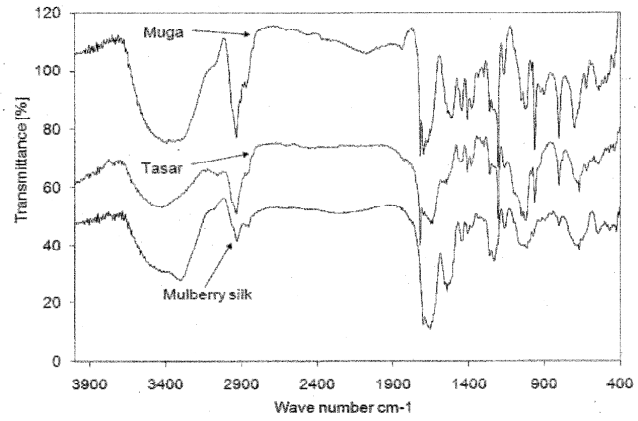


Fig. 2.2.24 Infrared spectra of Muga (*Antheraea assamensis*) Fibre

3. Resource Management and Environment Division

The North east India has always been considered a hot spot for floristic and faunastic diversity. The researchers of the Resource management and environment Division have been able to spearhead research on various burning environmental problems specific to the area. Some of the fields where significant contribution has been made are exploration of faunastic diversity in Assam, Arunachal Pradesh, Monipur and Nagaland, studies related to Bioremediation and phytoremediation of polluted Oil field soil, Studies related to chemical and enzymatic treatment of oil polluted soil, Bio-surfactants and their use for recovery of hydrocarbons from refinery sludge, and ecobiological study of different species of frog and fish of conservational importance.

There are three sections in this Division

1. Biodiversity section

2. Environmental biotechnology

3. Environmental chemistry

3.1. Biodiversity Section

Studies related to biodiversity include recording of fauna with fresh exploratory surveys, studying the ecology of the habitat, ecobiological study of selected species including food and feeding behavior, reproductive behavior, spawning season and

data related to metamorphosis of frog are some of the fields where publications have been made.

3.1.1 Exploration of Amphibian fauna of Assam, Nagaland, Manipur and Arunachal Pradesh and ecobiological study of selected species.

i) Significatant progress has been made towards exploration of amphibian faunal biodiversity in Assam, Arunachal Pradesh, Manipur and Nagaland. So far our publications include six species of frogs published as new record for India, one frog species new to science and a new genus of frog for India. In 2010 detailed development of two species of frog namely *Hylarana humeralis* (Boulenger, 1887) and *Hylarana leptoglossa* (Cope, 1868) has been published. Ecobiological study is carried out on species of conservational importance so that detailed base line information is available for the species for planning conservation measures in future.

ii) Study of aquatic biodiversity in wetlands of Assam is in progress .A total of 115 species of wetland fish recorded from studies in different wetlands of Assam which includes two new records of fishes for the Brahmaputra drainage.

3.1.2 TECHNOLOGY TRANSFER: Field application of phyto and Bioremediation technique for reducing oil contamination developed at IASST, Guwahati in collaboration with Oil india limited, Duliajan, Assam.

Phyto-assisted bioremediation, the use of plants and associated micro-organisms for degrading or immobilizing contaminants in soil is being used world over for remediation of moderately contaminated soil.

A technique of phyto-assisted bioremediation has been standardized at IASST so that this technique can be used by oil industry in Assam for reducing hydrocarbon contamination in the areas within the oil installation where oil spillage has taken place while handling or during transportion or dumping of oil sludge.

A few plant species native to the experimental area has been selected which showed effective hydrocarbon reducing capability during experimentation. Mass propagation of these plant species has been done in net house condition.

Fig. 3.1.1 Experiments and Mass multiplication of selected plants species.

Experiments were conducted with herb species belonging to family *cyperaceae* and *poaceae*. Some of these herb species has been planted in the Hydrocarbon contaminated site allotted to us for field trial.

Fig. 3.1.2 Plantation at Experimental site.

Soil quality is being monitored to check the percentage of reduction of TPH (Total petroleum hydrocarbon) in soil. Similarly native microflora were tested and isolated for field application that showed effective hydrocarbon degradation in laboratory conditions.

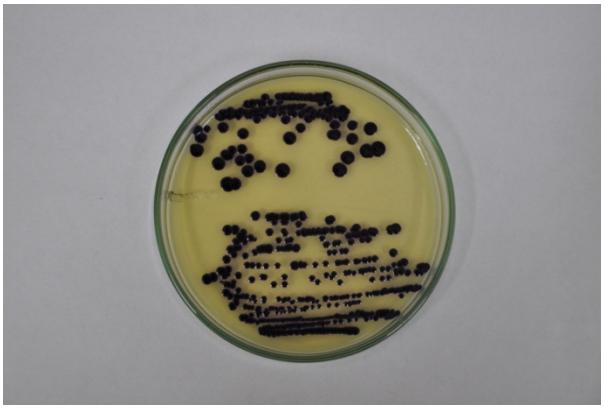


Fig. 3.1.3 Bacterial isolate-PRL from experimental site.

3.1.3 Study of aquatic biodiversity in all three selected watersheds of Arunachal Pradesh, India

Three watersheds of Arunachal Pradesh namely Kalaktang, Tenga and Remi have been selected for studying aquatic biodiversity. In the first year the Tenga watershed has been taken for the study.

Tenga River is an important tributary of the river Kameng. It is situated in the West Kameng district of Arunachal Pradesh, India. This river flows along a deep V-shaped valley to merge with the river Kameng near the town Bomdila. The river Tenga is highly torrential and its depth varies at different points ranging up to 1 meter. The river bed is stony with sandy bottom .The water of the river is turbid. The present study of icthyofaunal diversity of Tenga River was done seasonally i.e. Pre monsoon, monsoon and post monsoon season for a period of one year. During the survey period 9 cold water fish species belonging to 8 genera, 4 families and 2 orders were recorded in the river. Fishes collected by fisherman with the help of cast net, hook and lines were photographed and recorded.

3.1.4 Collection at Tenga river.

Temperature of the water varies from 18-20 degree Celsius. *Schizothorax richardsonii* Gray (1832) could be recorded in all seasons and were found to be more abundant than other fish species. Five species with adaptive modifications suitable for torrential habitat were recorded. Taxonomic identification of the fishes has been done along with their conservation status and ecology of the habitat.

A number of aquatic insect species has been recorded. As the river is highly torrential, only the species adapted for fast flowing water can be found here.

3.1.4 A study on Ichthyofaunal Diversity in five lotic ecosystems of kamrup district, Assam and ecobiological study of two species of conservational importance.

The present work was undertaken in five different landing sites to record indigenous fish diversity. The water bodies are located in diverse ecological conditions. These water bodies are breeding grounds of numerous commercially important and ecologically important fish species. Landing sites have been monitored regularly to record the availability of the fishes. Of the five sites the Basistha river (26^{o} 05.432/ and 91^{o} 46.712/) is a semi torrential stream and harbor different species characteristic of hill streams. The other four sites viz. Kukurmara (N 26^{o}04.365/ and E 91^{o} 25.766/), Dighali beel (26^{0} 13.644/ N and 91^{o} 39.491/ E), Silarmukh (26^{o}14.571/ N and 91^{o} 45.029/ E) and Kacharighat (N 26^{0} 11.586/ and E 91^{0} 45.130/) harbor different indigenous Fishes.

3.1.5 Fish landing site, Kukurmara.

A total of 112 species collected during this period will be an important fresh collection data for species at risk from these areas.112 species belong to 28 families and 9 orders. A fish *L.goalparemis Pillai and Yazdani, 1976* has been recorded for the first time from Kukurmara and Kacharighat. This is a new range extension report for the fish. Type locality of the fish is Goalpara recorded in Assam 1976.

Detailed ecobiological study was done on *N.atherinoides* Bloch, 1794.The fish is in the endangered category (CAMP, 1998). Knowledge of the reproductive behavior of fish in the endangered category is essential for conservation measures to be taken up in future.

The collected fish species were of following categories. Endangered (EN) 8species, Vulnerable (VU) 18, Data deficient (DD) 1, lower risk near threatened (LRNT) 35 and Lower risk least concern LRLC) 7 species. A large number of fish Not evaluated (NE) so far is of concern (43 species). The study has helped us verifying presence of some rare fauna with fresh collections which is very much essential in view of degradation of habitat and decline of fish fauna in nature. The study has helped us in evaluating the present indigenous fish diversity in these water bodies.

3.2. Environmental Biotechnology Section

There are various environmental problems that continue to plague our industries and agricultural land. With the rapid progress in the field of biotechnology solution to some of these

problems have become possible. Natural microflora are rich source for microbes, manipulation of which can solve many of these intriguing problems. An important field of study where progress has been made is bioremediation of hydrocarbon contaminated soil, studies on microbial surfactants having useful properties etc.

3.2.1 Bio-surfactants and their use for recovery of hydrocarbons from refinery sludge.

Biosurfactants are surface-active substances synthesized by living cells. They have the properties of reducing surface tension, stabilizing emulsions, promoting foaming and are generally non-toxic and biodegradable. Interest in microbial surfactants has been steadily increasing in recent years due to their diversity, environment friendly nature, possibility of large-scale production, selectivity, performance under extreme conditions and potential applications in environmental protection. Biosurfactants enhance the emulsification of hydrocarbons, have the potential to solubilise hydrocarbon contaminants and increase their availability for microbial degradation. The use of chemicals for the treatment of a hydrocarbon polluted site may contaminate the environment with their by-products, whereas biological treatment may efficiently destroy pollutants, while being biodegradable themselves. Hence, biosurfactant producing microorganisms may play an important role in the accelerated bioremediation of hydrocarbon contaminated sites. Moreover, these compounds can also be used in recovery of hydrocarbons from refinery sludge. Sludge is generated by sedimentation process in the bottom of crude oil and heavy black oil storage tanks, in sludge separator unit and in biological effluent treatment plant. Small amount of sludge may also be generated in various unit processes in a refinery. These sludges contain 30-60 % hydrocarbons depending on the sources of sludge. By using the bio-surfactant, it is possible to recover hydrocarbon from refinery sludge. So, an attempt has been made to recover hydrocarbons from refinery sludge by using bacteria producing bio-surfactant compounds.

For isolation of potent bacterial strains, soil samples were collected from oil fields situated at lakowa and Moran of Upper Assam and 29 morphologically different bacterial colonies were isolated. Pure culture of these 29 bacterial isolates was carried out by using nutrient agar medium and nutrient broth.

These 29 bacterial isolates were then again tested for biosurfactant activity. These isolates were grown on mineral media containing glucose as the sole carbon source and kept in the shaking incubator at 37˚C at 150 rpm for seven days and biosurfactant production was measured every day up to seventh day in the K11 Tensiometer (KRUSS GmbH, Hamburg). Out of these 29 isolates, 10 isolates were showing the property of biosurfactant production and could reduce the surface tension below 45 mN/m. These 10 bacterial isolates were further studied to select the most efficient one.

3.2.2 Screening of efficient surfactant producing strain(s) of bacteria.

The 10 isolates with biosurfactant production activity were again screened by

using different carbon sources. These carbon sources are water soluble. The different carbon sources used were glucose and glycerol. Each isolate was then grown in conical flasks containing mineral media and one of the above mentioned substrates and the flasks were kept in the shaking incubator at 37˚C at 150 rpm for seven days. Biosurfactant production was then measured regularly up to seventh day. Out of these 10 isolates, some had exhibited surface tension reducing property only on one substrate but the isolate RS-29 could reduce surface tension with both the substrates. So this was selected for further study.

The isolate RS-29 was then tested with different carbohydrate sources to select the most suitable carbohydrate source. It is found that glucose and glycerol are the most suitable carbohydrate sources for biosurfactant production by this microbe (see Fig).

The isolate RS-29 was analyzed for E(24) index. The E(24) index is given as percentage of height of emulsified layer (cm) divided by total height of the liquid column (cm) and was found that E(24) index was 67%. Further investigations are going on.

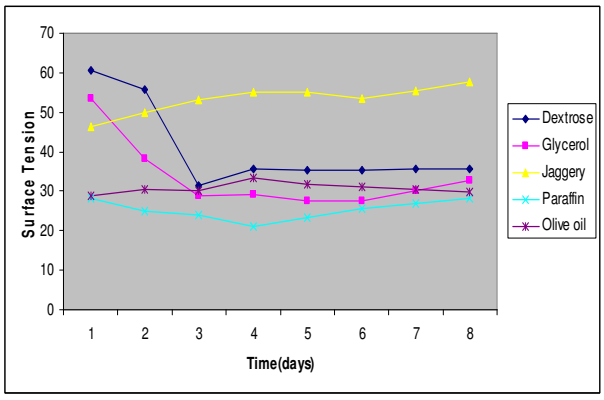


Fig. 3.2.1 Biosurfactant productions of bacterial isolate RS-29 on different carbon sources

3.2.3 Phytoremediation of Hydrocarbon Contaminated Soil of Oil Field Situated at Lakowa, Upper Assam, India

Phytoremediation has been accepted as a viable remediation method for petroleum-contaminated soil. Phytoremediation is the direct use of living green plants for in situ, or in place, removal, degradation, or containment of contaminants in soils, sludge's, sediments, surface water and groundwater. Keeping this in mind, an investigation on phytoremediation of hydrocarbons in petroleum-polluted soil of upper Assam is being carried out.

The soil samples collected from leakage sites of oil field situated at Lakowa, Sibsagar district of Assam, India was analyzed for physicochemical properties before conducting the experiment. The pH of the soil was acidic in nature (4.47), Water holding capacity was very low (16.05%) and organic carbon content was high (3.36%). The oil and grease content was found to be 37000 ppm. A total of five plants were selected for the study out of which three were taken from the contaminated sites of Lakowa oil field on the basis of their population number and other two were taken from the literature, which are locally available. Dissipation of the hydrocarbon in the soil after harvest of the plants was recorded. The uptake of TPH by the plants is also recorded. The uptake of TPH was found maximum in the shoot portion than root portion. A total of 11 Poly Aromatic Hydrocarbons (PAH) detected in the test soil samples. Out of 11, the PAH namely - Phenanthrene, Anthracene, Fluranthene, Pyrene, Benzo(A) anthracene and Benzo(A,H) anthracene were detected in the

soil after harvest of the plants (i.e. six months from the initiation of the investigation), while other PAH which were present in the experimental soil sample, were not detected in the soil after harvest of the plant. The investigation is going on.

3.3. Environmental Chemistry section

Contamination of soil is a common phenomenon during handling, storage and transportation of petroleum products. Though bioremediation and phytoremediation has been identified as viable alternative for reduction of hydrocarbon contamination in soil, the chemical treatment of soil for reducing contamination is being used by oil industries. Research is going to find out viable chemical treatment methods to contain hydrocarbon pollution in soil.

3.3.1 Chemical treatment of oil contaminated soil.

The chemical treatment (the Fenton) was applied for remediation of crude oil contaminated soil.

- The chemical treatment of crude oil contaminated soil adsorbed in peat resulted in lower crude oil removal and required higher addition of chemicals than the chemical treatment of crude oil in sand matrix.

- The reduction of absorbance at 254 nm gave evidence of aromatics degradation during the chemical treatment.

- The application of combined chemical + biological treatment may increase the effectiveness of soil remediation and economical feasibility.

3.3.2 Enzymatic activities of oil contaminated soil:

- Urease activity of refinery effluent as well as oil flaring contaminated soil at different pH have been evaluated.

- Arylsulphatase activity of refinery effluent as well as oil flaring contaminated soil at different time have been evaluated.

4. Mathematical Sciences Division

The Mathematical Sciences Division is carrying out basic research on selected areas and some database research work has been done on the problems related to the North-East region time to time from its inception. At present the members of the division are engaged in investigating certain problems in the areas of Sequence Spaces, Summability Theory, Spectral Theory, Fuzzy Mathematics, Applied Stochastic Process, Image Processing of Medical Data, Theoretical Plasma Physics, Numerical Computations.

4.1 Sequence Spaces, Series, Summability Theory.

The notations w, c, c_0 and ℓ_∞ denote the classes of *all*, *convergent*, *null* and *bounded* scalar valued single sequences respectively.

Let (X,q) be a seminormed space, seminormed by q. Then ${}_2w(X)$, ${}_2\ell_\infty(X)$, ${}_2c(X)$, ${}_2c^R(X)$, ${}_2c^B(X)$, ${}_2c_0(X)$, ${}_2c_0^R(X)$, ${}_2c_0^B(X)$ will denote the spaces of *all, bounded*, *convergent in Pringsheim's sense, regularly convergent*, *bounded convergent in Pringsheim's sense*, *null in Pringsheims sense*, *regularly null* and *bounded null in Pringsheim's sense* double sequence spaces respectively defined over (X, q).

Let m be a non- negative integers, then for Z a given sequence space we define

$$Z(\Delta_m) = \{x = (x_k) \in w : (\Delta_m x_k) \in Z\},$$

where $\Delta_m x = (\Delta_m x_k) = (\Delta x_k - \Delta x_{k+m})$ for all $k \in N$.

An *Orlicz function M* is mapping $M : [0, \infty) \to [0, \infty)$ such that it is *continuous*, *non-decreasing* and *convex* with $M(0) = 0$, $M(x) > 0$, for $x > 0$ and $M(x) \to \infty$, as $x \to \infty$.

Let X be a non empty set. Then a family of sets $I \subset 2^X$ (power sets of X) is said to be an *ideal* if I is additive (*i.e.* $A,B \in I \Rightarrow A \cup B \in I$) and hereditary (*i.e.* $A \in I$, $B \subseteq A \Rightarrow B \in I$).

A non- empty family of sets $\Im \subset 2^X$ is said to be a *filter* on X if and only if $\phi \notin \Im$, for each A, $B \in \Im$ we have $A \cap B \in \Im$ and for each $A \in \Im$ and $B \supset A$, implies $B \in \Im$.

4.1.1 On Some Double Sequence Spaces

Let M be an Orlicz function, we have introduced the following double sequence spaces

$${}_2c(M,q) = \{\langle a_{nk}\rangle \in {}_2w(q) : M\left(q\left(\frac{a_{nk} - L}{\rho}\right)\right) \to 0,$$

as $n, k \to \infty$, for some $\rho > 0\}$.

Similarly we have defined the sequence spaces ${}_2\ell_\infty(M, q)$, ${}_2c_0^R(M, q)$ and other related sequence spaces in a paper published in [*Mathematica Slovaca; 59(6) (2009), 767-776*].

It is shown that "*The spaces* $Z(M, q)$, *for* $Z = {}_2\ell_\infty$, ${}_2c^B$, ${}_2c_0^B$, ${}_2c^R$ *and* ${}_2c_0^R$ *are seminormed spaces*, *seminormed by*

$f(<a_{nk}>) = \inf\left\{\rho > 0 : \sup_{n,k} M\left(q\left(\frac{a_{nk}}{\rho}\right)\right) \le 1\right\}$".

Different algebraic and topological properties of this space have been investigated and some inclusion results have been established.

4.1.2 On *I*-convergent Paranormed Sequence Spaces

Let $p=(p_k)$ a sequence of non-negative real numbers. Then for a given ε>0, we introduce the sequence space

$c^I(p) = \{(x_k) \in w : \{k \in N : |x_k - L|^{p_k} \ge \varepsilon\} \in I$, for some $L \in C\}$.

Similarly have defined the sequence spaces $c_0^I(p)$, $m^I(p) = c^I(p) \cap \ell_\infty(p)$ and $m_0^I(p) = c_0^I(p) \cap \ell_\infty(p)$. It is shown that

"*Let* $(p_k) \in \ell_\infty$, *then the spaces* $m^I(p)$ *and* $m_0^I(p)$ *are paranormed* spaces, *paranormed by*

$g((x_k)) = \sup_k |x_k|^{\frac{p_k}{H}}$,

where $H = max\ (1, \sup_k p_k)$."

It is observed "The sequence spaces $m^I(p)$ *and* $m_0^I(p)$ *are nowhere dense subsets of* $\ell_\infty(p)$." Some algebraic and topological properties of these sequence spaces like separability, solidity, symmetricity etc have been verified. Some inclusion results have been established. The results have appeared as a research paper in [*Mathematica Slovaca*; 59(4) (2009), 485-494].

4.1.3 Sequences of Fuzzy Numbers

A fuzzy real number *X* is fuzzy set on *R* and is a mapping $X: R \to I(=[0,1])$ associating each real number *t* with its grade member ship $X(t)$. Let *D* denote the set of all closed and bounded intervals $X = [a_1, a_2]$ on the real line *R* . Let $\bar{d}$: $R(I) \times R(I) \to R$ be defined by

$$\bar{d}(X, Y) = \sup_{0 \le \alpha \le 1} \left\{\max\left\{\left|a_1^\alpha - b_1^\alpha\right|, \left|a_2^\alpha - b_2^\alpha\right|\right\}\right\},$$

where $X^\alpha = \left[a_1^\alpha, a_2^\alpha\right]$ and $Y^\alpha = \left[b_1^\alpha, b_2^\alpha\right]$ are α-level sets for $\alpha \in I$ of *X* and *Y* respectively.

Some Classes of New Type of Difference Sequences.

In the paper published in [*Mathematical Modelling and Analysis*, 14(3)(2009), 391-397] it is shown "*The classes of sequences* $\ell_\infty^F(\Delta_m)$, $c^F(\Delta_m)$, $c_0^F(\Delta_m)$ *of generalized difference bounded*, *convergent and null sequences of fuzzy real numbers are complete metric spaces by the metric*

$$\rho(X,Y) = \sum_{k=1}^{m} \bar{d}(X_k, Y_k) + \sup_k \bar{d}\ (\Delta_m X_k, \Delta_m Y_k).$$

Also different properties of these spaces like solidness, symmetricity, convergence free etc have been examined.

4.1.4 Bounded Variation Double Sequences

We have introduced the class of *fuzzy real-valued bounded variation* double sequences ${}_2bv^F$ as follows:

$$ {}_2bv^F = \left\{ (X_{nk}) : \sum_{n=1}^{\infty} \sum_{k=1}^{\infty} \bar{d}(\Delta X_{nk}, {}_2\bar{0}) < \infty \right\}, $$

where $\Delta X_{nk} = X_{nk} - X_{n+1,k} - X_{n,k+1} + X_{n+1,k+1}$, for all $n, k \in N$.

It is shown that "*The class of sequences* ${}_2bv^F$ *is a complete metric space with respect to the metric* ρ *defined by* $\rho(X, Y)_\Delta = \bar{d}(X_{n1}, X_{n1}) + \bar{d}(X_{1k}, X_{1k}) + \sum_{k=1}^{\infty} \bar{d}(\Delta X_{nk}, \Delta X_{nk})$ ". It is verified that the class of sequences ${}_2bv^F$ is neither convergence free nor symmetric. Also it is not solid hence not monotone.

4.2 Applied Mathematics - Theoretical Plasma Physics

Study on nonlinear waves in plasmas has attracted a great deal of attention during last several decades. The milestones have started from mathematical formalism made by Korteweg-deVries (1895)[D. J. Korteweg and G. deVries, *Philos. Mag.* 39, 422 (1895)] and Sagdeev (1966) [R. Z. Sagdeev, *Rev. Plasma Phys*. 4, 23 (1966)] the solution of which describes the salient properties on nonlinear waves in astrophysical problems and laboratory plasmas. Both the approaches have made a solid platform for studying the different nature of nonlinear waves in plasmas, and provide a basis in bridging the observations between theory and experiments in laboratory as well as in spaces. Further it becomes important in impure astroplasmas contaminated by the presence of dust grains which appears in every space environments e.g. magnetosphere, ionosphere, cometary tails, planetary ring systems, interstellar, and circumstellar clouds in asteroid zones as well as in laboratory plasmas. It has been realized that, without its proper consideration, observations might be erroneous, and thus the thrust area spurred to do research in such plasmas to know the ubiquitous nature of dusty dynamics in space. To rely on them, day by day, the constituent configurations are changing with the view to explain features observable as applications and evidences. Our fascination is to study features on the dynamical behaviours of dust grains especially levitated from the Moon's surface in to sheath around moon. Thereby we are interested to study the formation of nebulons: the crystallization of dust grains around the Moon's surface. In continuation, to this, we are further interested to study the nature of dust atmospheres in interplanetary spaces, Saturn's Ring , asteroid zones, as well as in many other astrophysical space environments and are often likely to yield surprising observations in such fastest growing research field.

Again, nonlinear wave phenomena in astroplasmas has the influences of rotation, however small might be, and thus the study will be taken up, otherwise the results might be erroneous. Based on the evidences [S. S. Chandrashekar, *Mon. Not. Roy. Astrophys. Soc*. 113, p 667(1953)], our interest is to know the effect of rotation in the formation of sheath, soliton of various kinds and soliton radiation with the view to explain the inherent features

similar to solar radio burst. Our mode of study will be around the environments of slow rotating stars (such as white dwarfs etc.) as well as of high rotating stars (Neutron stars and Pulsars etc.) i.e. consideration of plasmas in star's magnetosphere and based on thoughtful choice of astroplasmas data, we hope to highlight new findings. Parallel to the earlier works, study will be furthered on the dynamical behaviours of dust grains in spaces so as to find the formation of nebulons i.e. dust cloud structures around the celestial bodies in interplanetary spaces, cosmic plasmas (such as in Supernova, Milky way's, Saturn's ring etc.) for ongoing research findings. Some of the investigations on acoustic modes, under small amplitude approximation, e.g. robust solitary waves (mingle solitons) of different kinds, double layers and sheath formation have been made, and evidenced in lower ionosphere supported by the Freja Scientific Satellite[D.-J., Wu, G., Huang, D.-Y . and Wang, C.G. Falthammar : *Phys. Plasmas* 3, 2879 (1996)]. In continuation, studies have been accrued in different plasma models and recently with the consideration of quantum plasmas, laser plasmas finds interest as applications. Ongoing interest is to develop first the formulation of problems in quantum plasma with its concept centered around the astrophysical plasmas in studying the ion-acoustic waves augmented through the derivation of nonlinear wave equation e.g. n Zakhorov equation, Kortewege-deVries equation, Sagdeev potential wave equation etc. Next it has been seen all the plasma in astrophysical problems are impure plasma, being a common occurrences in space, and consequently study on the dyanamical behaviours of dust grains is within interest. The chosen problems might cause the complexity in the dynamical system and desired results are likely to be determined by computational simulation with a hope to find a close relation between the theory and experiments in space, in plasma technology and fusion for the future. In present decade the studies in astroplasmas have drawn pioneer interest with bridging between theory and satellite observations by means of plasma modeling. However, plasma models depend on the constituents of the space regions and thus following the aim under consideration, multicomponent plasma spanning physical systems like pulsar magnetospheres etc. has become an object of continuous serious interest. However, the basis on totality of the investigations is mainly drawing inspiration for the observations in spaces by the scientific satellites and thus motivates to extend the interest on studying nonlinear wave propagation in astroplasmas. However, complexity in the dynamical system needs to develop new technique(s) and, in case of failure in solving analytically for wave phenomena, computation method will be employed that too with the input of appropriate data.

4.3 Applied Stochastic Process.

Queueing theory is a significant area of current research in the branch of Applied Stochastic Process. In this context, some important investigations have been made on different branches of queueing theory such as *Vacation models*, *Retrial models* and *Control of queues*.

4.3.1 Work done on Vacation Models :

Vacation models are characterized by the fact that the idle time of the server may be used for other secondary jobs, for instance to serve the customers in other systems. Allowing server to take vacations makes the queueing models more realistic and flexible in studying real world queueing situations. Applications arise naturally in call centers with multi-task employees, customized manufacturing, telecommunication and computer networks, maintenances activities, production and quality control problems, etc. A wide class of policies for governing the vacation mechanism has been discussed in the literature. Bernoulli vacation model is one of the important vacation model with non-exhaustive service: The classical vacation scheme with Bernoulli schedule discipline was introduced and studied by *Keilson and Servi* [*Journal of Applied Probability,* 23(1986), 790-802]. In their model of $GI/G/1$, a single channel goes on vacation when the system becomes empty. The server keeps taking vacations until at least one unit is present in the system upon completion of a vacation period. If on service completion the system is not empty, the server goes on vacation with probability $p(0 \le p \le 1)$ and resume service with probability $q = 1 - p$. In this context, we investigated a batch arrival Bernoulli vacation model with a single vacation, where the concept of a setup time is also introduced. They provide complete analysis of this type of models including recursive scheme for computation of limiting probabilities. Further distribution of unfinished work has also been obtained.

4.3.2 Work done on Retrial Models:

During last two decades there have been considerable attention paid to the analysis of queueing systems with repeated attempts (or retrial queues). Retrial queues are characterized by the following feature that a customer who finds the server busy upon arrival is obliged to leave the service area to repeat his demand after some random amount of time called *retrial time*. Between trials, the blocked customer joins a pool of unsatisfied group of customers called "*orbit*" or "*retrial group*". The pioneering studies of retrial queues are to present the concept of retrial time as an alternative to the classical model of telephone systems. In this context each block customer generates a stream of repeated requests independently of the rest customers in the retrial group. Thus, in the so called *classical retrial policy*, the intervals between successive repeated attempts are exponentially distributed with rate $n\mu$ (say), when the number of customers in the retrial group (orbit) is '*n*'. This type of model has been studied by *Yang and Templeton* [*QUESTA,* 2 (1987), 201-233] and *Falin* [*QUESTA,* 7(1990), 127 – 168]. In this context, we have investigated various stochastic processes such as orbit size distribution and system size distribution for an $M/G/1$ queue with two phases of service under Bernoulli vacation schedule. The investigation includes the embedded Markov chain at a departure epoch, orbit size distribution and joint distribution of the server state and number in the orbit. Further, we have developed a recursive scheme for computation of limiting probabilities.

Many authors have investigated system with a repairable service station where in the service channel is subject to breakdown from time to time or some other kind of service interruptions. Recently, *Wang et.al* [*QUESTA,* 8(2001), 363–380] studied a repairable $M/G/1$ retrial queueing model from the view point of reliability viewpoint for first time, both the queueing indices and reliability characteristics are obtained. In this context, *Choudhury and Deka* [*Applied Mathematics and Computation*, 215 (2009), 936–949] generalized the above model for the case of $M/G/1$ type of retrial queue with two phases of service subject to server breakdown and repair. Their investigation includes stationary distribution of the state of the server and number of customers in the orbit. Further, some important performance measures and some reliability indices are also obtained. Moreover, reliability function of this type model has also been obtained.

Artalejo and Gomez-Corral [*Journal of Applied Probability,* 34 (1997), 223-233] introduced a more general kind of retrial policy by incorporating both possibilities by assuming that when there are *n* customers in the system the time intervals between successive repeated attempts are exponentially distributed random variable with parameter $\mu_n = n\mu + \varepsilon(1-\delta_{n,0})$, where μ can be considered as the retrial rate per customer and ε the rate at which the server seeks service for customer whenever he is idle and $\delta_{i,j}$ denotes Kronecker's delta function. Such type of policy is known as *linear retrial policy*. In this context we have made extensive analysis of an $M/G/1$ retrial queue with two types of heterogeneous service and Bernoulli vacation schedule, where just before start service of a customer , he (she) has an option to choose any one kind of service . Further, in a subsequent paper *Choudhury and Deka* [*International Journal of Information and Management Sciences,* 20 (2009), 54–563] investigated the system size distribution for two phase service system with unreliable server under *linear retrial policy*.

4.3.3 Work done on Control of Queues:

Control of queue is one of the most significant area of research. It is customary to classify models into two general categories: descriptive and prescriptive models. Descriptive models are models which describe some current real world situation, while prescriptive models are models which prescribe what real world situation should be, that is, optimal behavior at which to aim.

The determination of an optimal policy for a queueing system is an important issue. This is usually done by developing the total expected cost function per unit time for the system and then deriving the relevant optimal system parameters. In this context *Choudhury, Ke and Tadj [Journal of Computational and Applied Mathematics*, 231 (2009), 349–364] provided a complete analysis including the optimization problem of the two phase service system for unreliable server. Further, in a subsequent paper *Tadj and Choudhury* [*Applied Mathematics Letters*, 22 (2009), 1710–1714] have investigated optimization problem for a

bulk service queueing system for unreliable server.

4.4 Image Processing.

4.4.1 Intelligent system for automated cervical cancer diagnosis and prognosis using Fuzzy C-means classifiers and Baye's Classifier.

Pattern recognition (PR) and Machine Learning (ML) can be viewed as an attempt to automate parts of the Data Analysis methods.

Some PR and ML methods are studied and some of them are used to analysis the data related to cancer so as to develop an expert system or an automated diagnosis system. The methods studied are Fuzzy mathematical approach, Bayesian approach and Pearsonian system of curves.

Computational diagnostic tools and artificial intelligence techniques provide automated procedures for objective judgments by making use of quantitative measures and machine learning techniques. In this work we want to construct a Fuzzy C Means based classifier in comparison with Bayesian classifiers and Artificial Neural Networks for the prognosis and diagnosis of cervical cancer. Some comparative studies have been carried out concerning both the prognosis and diagnosis problem demonstrating the superiority of the proposed C- Means classifier algorithm in terms of sensitivity, specificity and accuracy. The framework includes a feature extraction such as cellular area, distribution of cellular area, eccentricity, compactness of cells in robust manner.

Fuzzy C-mean: -Fuzzy C-mean clustering is a method of clustering which allows one piece of data to belong to two or more clusters. This method is frequently used in pattern recognition and image processing. It is based on minimization of the following objective function

$$J_m = \sum_{i=1}^{N}\sum_{j=1}^{C} u_{ij}^{m} \left\| x_i - c_j \right\|^2 ,$$

where, 'm' is real number between 1 and infinity(∞).

u_{ij} is the degree of membership of Xi in the cluster, j.

Xi is the i^{th} element of d-dimensional measured data.

C_j is the d-dimensional center of the cluster.

||*|| is the norm expressing the similarity between any measured data and the center of the cluster.

Fuzzy partitioning is carried out through an iterative optimization of the objective function, with update of the membership, u_{ij} and cluster center, C_j by

$$u_{ij} = \frac{1}{\sum_{k=1}^{C}\left(\frac{\left\| x_i - c_j \right\|}{\left\| x_i - c_k \right\|}\right)^{\frac{2}{m-1}}} ,$$

$$c_j = \frac{\sum_{i=1}^{N} u_{ij}^{m} \cdot x_i}{\sum_{i=1}^{N} u_{ij}^{m}}$$

Iteration will stop when

$$\max_{ij}\left\{\left|u_{ij}^{(k+1)}-u_{ij}^{(k)}\right|\right\}<\varepsilon,$$

where, ε is the termination criterion lies between 0 and 1 and k is the number of iteration steps. The procedure converges to a local minimum or saddle point of Jm.

The steps in Fuzzy C-mean algorithm are as follows

1. *Initialize $U=[u_{ij}]$ matrix, $U^{(0)}$*

2. *At k-step: calculate the centers vectors $C^{(k)}=[c_j]$ with $U^{(k)}$*

$$c_j=\frac{\sum_{i=1}^{N}u_{ij}^{m}\cdot x_i}{\sum_{i=1}^{N}u_{ij}^{m}}$$

3. *Update $U^{(k)}$, $U^{(k+1)}$*

$$u_{ij}=\frac{1}{\sum_{k=1}^{C}\left(\frac{\|x_i-c_j\|}{\|x_i-c_k\|}\right)^{\frac{2}{m-1}}}$$

4. *If $||\ U^{(k+1)}-U^{(k)}||<\varepsilon$ then STOP; otherwise return to step 2.*

Bayesian approach: - The classifiers that are described to date can be implemented with a priori knowledge relevant to pattern classes. The system goes along based on some priori knowledge and modifies its behaviour on the basis of new knowledge. We need a statistical theory that enables the system to do so and Bayesian statistics is such a theory. Bayesian approach can be used to predict the probabilistic relationship between diseases and symptoms. The fundamental notion of Baye's theory is that of conditional probability. It states:

$P(H_i|E)=P(E|H_i).P(H_i)/P(E|H_1).P(H_1)+\ldots\ldots\ldots$
$+P(E|H_k).P(H_k)$

Where $P(H_i|E)$= the probability that hypothesis H_i is true given a priori knowledge E.

$P(E|H_i)$= the probability that we will observe a priori knowledge E given that hypothesis i is true. It is called distribution function.

$P(H_i)$= the a priori probability that hypothesis i is true in the absence of any a priori knowledge.

k = Number of possible probabilities.

The data to be fed to the Fuzzy C-mean classifier and Baye's classifier are obtained from the digitized images of Pap smear test of several patients.

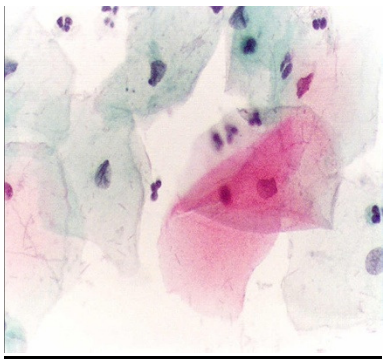


Fig-(a)

Fig- (b)

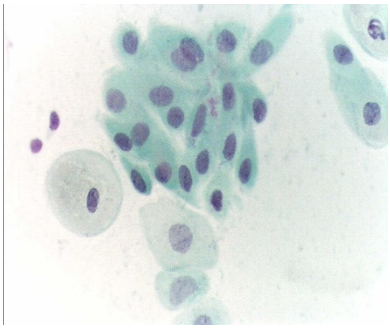


Fig- (c)

Fig- (d)

Fig. 4.4.1 (a) Original image showing normal cervical cell. Figure-(b) Segmented image showing only the cell nuclei. Figure-(c) Original image showing cancerous cells in initial stage that is mild dysplasia. Figure-(d) Segmented image showing only the cell nuclei.

4.4.2 Distribution Theory

The Pearsonian Type III Curve and its Potentials In Projecting Insurance Data.

It can be said that insurance is a cooperative device to share the sufferings of unfortunate persons in a group. For example in case of motor insurance, suppose in a town there are 500 vehicles and the value of each vehicle is Rs 50,000. Say, every year one vehicle gets damaged resulting into a loss of Rs 50,000. If the owners of 500 vehicles contribute Rs 100 each in a common fund that would become Rs 50,000. This is sufficient to pay Rs 50,000 to the owner whose vehicle got damaged. So it can be said that the risk of one owner is divided and spread over 500 owners in a town.

The share of motor insurance in the total business of general insurance is very big in terms of volume and value. A recent survey conducted by Surface Transport Ministry in India has shown that numbers of automobiles are increasing day by day at a very high rate. Motor vehicle is a valuable property and is exposed to damage or loss. For insurance companies it is thought that it is very important to estimate the financial amount to be reserved for settlement of claims along with its value.

To represent the data the popular generalized system of curves namely the Pearsonian System of curves is used. After calculating the constants it is found that the Pearsonian Type III curve is best fit for such data. Moreover, it has been also proved that the method of maximum likelihood estimation is the best for estimation of parameters.

The form of the distribution function of Type III curve is

where $y = y_0\left(1+\frac{x}{a}\right)^{\nu a} e^{-\nu x}, \quad -a \le x \le \infty$

$$p = va$$

$$y_0 = \frac{N}{a} \cdot \frac{p^{p+1}}{e^p \Gamma(p+1)}$$

The maximum likelihood equations are usually complicated so that the solutions cannot be obtained directly. A general method would be to assume a trial solution and derive linear equations for small additive corrections. The process can be repeated until the correction become negligible. The scoring method was adopted for obtaining the linear equation for the additive corrections.

The mathematics for the estimation by scoring method was first developed and the same was validated by data collected from insurance companies. The amount for claims were categorized into four classes, viz. < Rs.20,000, Rs.20,000- Rs.50,000, Rs.50,000- Rs.1,00,000 and >Rs.1,00,000.

Here the claim intimation figures of motor vehicles of National Insurance Company for the year 2005-06, 2006-07 and 2007-08 are used. The value of chi-square for the same data was also calculated for number of claims estimated by the method of moments. Though both the chi-squares were significant at 1% level of significance, it is seen that chi-square as obtained by the method of maximum likelihood is much less than that value indicating a better fit. Moreover it is established that the scoring method can be effectively used with distribution systems for better estimation of parameters.

5. Library and Information Center

The IASST Library and Information Center strives to evolve as a model and leading multidisciplinary science library since the inception of the institute in 1974.

The Library and Information Center provides need based documents and information services to the scientists, research scholars, students and staff members of IASST, as well as outside users also. To share resources, a close liaison is maintained with some institutes in the country. The library acquires books and journals mainly related to material sciences, mathematical sciences, resource management & environmental sciences, life sciences and also acquire reference books from time to time.

A view of Library

5.1 Modernization of Library and Information Center:

The work for modernization of library and information center has been taken up and the process is going on for procurement of

equipments to strengthening the services of dissemination of information to the faculties and research scholars. The equipments like HP PC, Laser Printer, Bar-Code Scanner, Bar-Code Printer, Online UPS, furniture's is procured.

5.2 Digital Library Initiatives:

The process for digitization of institutional repositories of scholarly output of the faculties will have to be started shortly.

5.3 Membership of Consortia:

The IASST Library and Information Center is a member of National Knowledge Resources Consortium (NKRC), previously CSIR- DST E-Journals Consortium. The library are getting full text access to several online journals and database services from IOP, ACS, AIP, CUP, T&F, Emerald, SciFinder etc.

5.4 Subscription:

The library subscribed for 66 scientific journals both Indian & Foreign and 7 national and local newspapers. Out of 66 journals some are online accessibility and some are have institutional life membership. Besides this, library received the annual report, newsletter, bulletin, and progress report from different organizations as a gratis/exchange document.

5.5 Activities:

1. New Additions

Books	…… 514
Reports	…… 147
CD-ROMs	…….. 18

2. Other Activities

Visitors using the Library	…… 422
Circulation of Books/Journals etc.	…… 823
Photocopying (No. of pages)	…… 48639
Number of Annual Reports mailed.	…… 60
No. of INTERNET Searches provided.	…… 29
Current Awareness Service.	…… 57
Selective Dissemination Information Service	…… 36
Referral Service	…… 108
Preparation of serials holding list	…… Completed

3. Total Library Collections

Books	…… 7823
Journals (Bound Volumes)	…… 1008
Journals subscribed for 2010	…… 66
Journals received (Gratis/Exchange)	.. 12
Reports	……. 1198
Reprints	……. 15
Thesis/Dissertations	……. 261
Current contents of Journals	……. 12
Misc. CD's	…… 557

6. Projects

6.1 Ongoing Projects

Project-1. Investigation of collective processes in laboratory dusty plasma.

Funded by ISRO.

Project cost Rs. 16.40 lakhs

Duration: 2006-2009

Dr. H. Bailung- Principal Investigator

Prof. Joyanti Chutia- Co- Principal Investigator

Mr. Manoj Kr. Deka- JRF

Project-2. Basic experiments in multicomponent plasma with negative ions.

Funded by DST, GoI.

Project Cost: Rs. 34.60 lakhs

Duration: 2006-2010

Dr. H. Bailung- Principal Investigator

Prof. Joyanti Chutia-Co-Principal Investigator

Ms. Sumita K Sharma- SRF

Project-3. Development of RF Plasma polymerization process for deposition of hard transparent and corrosion resistant coating on Bell metal and surface modification of muga silk fibres.

Funded by DAE, GoI.

Project Cost: Rs. 24.00 lakhs

Duration: 2007-2010

Prof. Joyanti Chutia- Principal Investigator

Dr. H. Bailung- Co- Principal Investigator

Dr. A.R. Pal- Co- Principal Investigator

Prof. D.S. Patil- Principal Collaborator, BARC Mumbai

Mr. Arup Jyoti Choudhury- JRF

Mr. Rakesh Singh- Laboratory Technician

Project-4. Studies on the discharge characteristics of pulsed plasma system for synthesis of conducting polymer films.

Funded by DST, GoI under Fast Track Scheme.

Project Cost: Rs. 19.35 lakhs

Duration: 2009-2012

Dr. Arup Ratan Pal- Principal Investigator

Project-5. Development of nanocomposite material based organic-inorganic hybrid flexible solar cell by plasma polymerization and magnetron sputtering combined process.

Funded by BRNS, DAE, GoI.

Project Cost: Rs. 19.01 lakhs

Duration: 2009-2012

Dr. A.R. Pal- Principal Investigator

Prof. Joyanti Chutia- Co-Investigator

Dr. H. Bailung- Co-Investigator

Prof. D.S. Patil- Principal Collaborator, BARC Mumbai

Project-6. Development of Liquid Crystalline Polymers

Funded by MCIT, DIT, GoI.

Project Cost: Rs. 25.4 lakhs

Duration: 2006-2010

Dr. Neelotpal Sen Sarma- Principal Investigator

Prof. Joyanti Chutia- Co- Investigator

Md. Samiul Hoque – JRF

Project-7. Ab initio calculations of vibrational and thermodynamic properties of oxides under pressure

Funded by DST, GoI under SERC FAST Track Scheme.

Project Cost: Rs. 10.92 lakhs

Duration: 2007-2010

Dr. Munima B Sahariah-Principal Investigator

Project-8. Surface self-assembly @ constructive nanolithography enroute to polyaniline based nano devices.

Funded by DST, GoI under SERC FAST Track Scheme.

Project Cost: Rs. 11.28 lakhs

Duration: 2008-2011

Dr. Devasish Chowdhury- Principal Investigator

Project-9. Assessment of impact of anthropogenic activities on Soil/Water and certain Medicinal Plants species in and around Bharalu River in Guwahati City.

Funded by Ministry of Environment & Forest, GoI.

Project Cost: Rs. 19.28 lakhs

Duration: 2010-2013.

Dr. J. Kotoky- Principal Investigator

Mr. Bhaskar Sarma- JRF

Project-10. Development of Broad Spectrum remedy from Natural Sources for Health Care with Special references to Skin Ailments.

Funded by DRDO, Ministry of Defence, GoI.

Project Cost: Rs. 9.98 lakhs

Duration: 2008-2010

Dr. J. Kotoky-Investigator

Mr. Kaustav K. Sarma- JRF

Project-11. Assessment of Risk due to intake of artificial colours through foodstuffs available in the N.E. Region including Sikkim.

Funded by North Eastern Council, Shillong, Ministry of DONEAR, GoI.

Project Cost. Rs. 24.84 lakhs

Duration: 20010-2013

Dr. J. Kotoky- Principal Investigator

Project-12. Plant-Diversity & Environment Education through Students of Assam.

Funded by DST, GoI.

Project Cost: Rs. 11.74 lakhs

Duration: 2008-2011

Dr. J. Kotoky- Principal Investigator

Mr. Rupak Sarma- JRF

Project-13. Evaluation of antioxidant property of some selected fruits of North East India – a biochemical approach.

Funded by DST, GoI.

Project Cost: Rs.: 12.45 lakhs

Duration: 2007-2010

Dr. (Mrs.) Rajlakshmi Devi- Principal Investigator

Prof. D C Deka- Co-Investigator

Ms Tiluttama Mudoi- JRF

Project-14. Study of the effect of leaf extracts of *Clerodendron colebrookianum* Walp (Nefafu) on lipid peroxidation, lipid profile and antioxidant status in cholesterol fed rat.

Funded by ICMR, GoI.

Project Cost: Rs. 9.36 lakhs

Duration: 2007-2010

Dr. (Mrs.) Rajlakshmi Devi- Principal Investigator

Prof D K Sharma - Co- Investigator

Mr. Dulal C. Boruah – SRF

Project-15. Development of a package for seed production of Muga Silkworm.

Funded by NABARD.

Project Cost: Rs. 16.60 lakhs

Duration: 2009-2012

Dr. (Mrs.) Dipali Devi- Principal Investigator

Project-16. Phytoremediation of hydrocarbon contaminated soil of Upper Assam.

Funded by: Ministry of Environment and Forests, GoI.

Project Cost: Rs.13.22 lakhs

Duration: 2007-2010

Dr. Suresh Deka- Principal Investigator

Dr. Neelotpal Sen Sarma- Co-Investigator

Mr. Hemen Deka- SRF

Project-17. Bio-surfactants and their use for recovery of hydrocarbons from refinery sludge.

Funded by: Department of Biotechnology, GoI.

Project Cost: Rs. 27.62 lakhs

Duration: 2008-2011

Dr. Suresh Deka- Principal Investigator

Prof. K. G. Bhattacharyya- Co-Investigator

Ms. Rashmi Rekha Saikia, JRF

Project-18. Study of aquatic biodiversity in all three selected watersheds of Arunachal, Pradesh, India.

Funded by NRDMS Division,DST, GoI.

Project Cost: 11.50 lakhs

Duration: 2009-2012

Dr. Sabitry Choudhury Bordoloi- Principal Investigator

Mr. Mrinal kumar Das- JRF

Mr. Pinku Bora- FA

Project-19. Field application of phyto and bioremediation technique for reducing oil contamination developed at IASST, Guwahati in collaboration with OIL INDIA LIMITED, Duliajan, Assam.

Funded by: OIL, DULIAJAN, ASSAM, INDIA.

Project Cost: Rs. 27.9 lakhs

Duration: 2009-2011

Dr. Sabitry Choudhury Bordoloi: Principal Investigator

Mr. Rubul Saikia- JRF

Mr. Budhadev Basumatari- JRF

Mr. Dhaneswar Boro- Field Asstt.

Mr. Ailek Chakhap- Field Asstt.

Project-20. Studies on Some Pattern Recognition and Machine Learning Models with Application to real life problems related to cancer data and development of algorithms based on Pearsonian system of curves.

Funded by DST, GoI.

Project Cost: Rs. 11.57 lakhs

Duration: 2008-2011.

Dr. Lipi B. Mahanta- Principal Investigator

Prof. Dilip C. Nath- Co-Investigator

Prof. Dwijesh Dutta Majumder- Advisor

Mr. Chanda Kumar Nath- JRF

Project-21. Study on the Coherent Structure of Dust-ion-acoustic Nebulons in the interstellar space Plasma as well as on the surface of moon and rotating stars.

Funded by ISRO-RESPONS

Project Cost: Rs. 14.31 lakhs

Duration: 2008-2011.

Professor G.C. Das- Principal Investigator

Ms. Rupa Chakraborty- JRF

Project-22. Nutritional Status of the pregnant women in the low socio-economic areas in Kamrup District of Assam.

Funded by CSO, MOSPI, GoI.

Project Cost: Rs. 3.95 lakhs

Duration: 2009-2010.

Dr. Mrs. Lipi B. Mahanta - Principal Investigator

Dr. Mrs Arundhuti Devi - Joint Investigator

Ms. Tanushree Deb Roy - Research Officer

Ms. Rangmili Gogoi Dutta - Research Assistant

Project-23. Studies on the class of *n*-normed Sequence Spaces Related to ℓ_p Space.

Funded by DST, GoI.

Project Cost: Rs. 5.70 lakhs

Duration : 2009-2012.

Ms. Stuti Borgohain - Principal Investigator

Dr.B.C. Tripathy- Supervisor

6.2 Completed Project

Project-1. A study on Ichthyofaunal Diversity in five lotic ecosystems of kamrup district, Assam and ecobiological study of two species of conservational importance.

Funded by: NBFGR, Lucknow.

Project Cost: Rs. 1.57 lakh

Duration: 2008-2009

Dr. Sabitry Choudhury Bordoloi- Principal Investigator

Ms. Anjali Baishya- Project Scientist

7. Publications

7.1. In Cited journals

1. **Assaf Zeira, Devasish Chowdhury, Stephanie Hoeppener, Shantang Liu, Jonathan Berson, Sidney R. Cohen, Rivka Maoz, and Jacob Sagiv** (2009): Patterned Organosilane Monolayers as Lyophobic-Lyophilic Guiding Templates in Surface Self-Assembly: Monolayer Self-Assembly versus Wetting-Driven Self-Assembly, Langmuir **25**, 13984.

2. **H. Kakati, A.R. Pal, H. Bailung and Joyanti Chutia** (2009): Deposition of nanostructured crystalline and corrosion resistant alumina film on bell metal at low temperature by rf magnetron sputtering, Applied Surface Science **255**, 7403.

3. **N.C. Adhikary, M.K. Deka and H. Bailung** (2009): Observation of rarefactive ion acoustic solitary waves in dusty plasma containing negative ion, Phys. Plasmas **16**, 063701.

4. **S.K. Sharma and H. Bailung** (2010): Characteristics of large amplitude compressive ion acoustic wave in ion beam multicomponent plasma, Phys. Plasmas **17**, 032301.

5. **K. Devi, S.K. Sharma and H. Bailung** (2010): Production and characteristics of low temperature and low density plasma using a magnetic filter, J. Phys.: Conf. Series **208**, 012050.

6. **S.K. Sharma, K. Devi and H. Bailung** (2010): Characteristics of ion acoustic modified Korteweg de Vries (KdV) solitons in multicomponent plasma with negative ions, J. Phys.: Conf. Series **208**, 012036.

7. **S.K. Sharma and H. Bailung** (2010): Characteristics of large amplitude compressive ion acoustic wave in ion beam multicomponent plasma, Phys. Plasmas **17**, 032301.

8. **N.C. Adhikary, A.P. Misra, H. Bailung and J. Chutia** (2010): Ion-beam driven dust ion-acoustic solitary waves in dusty plasmas, Phys. Plasmas **17**, 044502.

9. **Arup Jyoti Choudhury, Joyanti Chutia, Hemen Kakati, Shruti A. Barve, Arup Ratan Pal, Neelotpal Sen Sarma, Devasish Chowdhury and Dinkar S. Patil** (2010): Studies of radiofrequency plasma deposition of hexamethyldisiloxane films and their thermal stability and corrosion resistance behavior Vacuum **84**, 1327.

10. **H. Kakati, A.R. Pal, H. Bailung & Joyanti Chutia** (2010): The influence of RF power and gas pressure on the surface characteristics of aluminium oxide deposited by RF magnetron sputtering plasma, Journal of Physics: Conference Series **208,** 012102.

11. **A.J. Choudhury, H. Kakati, A.R. Pal, D.S. Patil and Joyanti Chutia**, (2010): Synthesis and characterization of plasma polymerized styrene films by rf discharge, Journal of Physics: Conference Series **208,** 012104

12. **Sankar Moni Borah, Heremba Bailung and Joyanti Chutia** (2010): Study of the sheath potential structure using emissive probe in dc magnetron plasma, Journal of Physics Conference Series **208,** 012128.

13. **Paresh Chakravarty, N. Sen Sarma and H.P. Sarma** (2010): Removal of lead (II) from Aqueous Solution using heartwood of Areca catechu powder, Desalination **256**, 16-21

14. **Munima B Sahariah and Subhradip Ghosh** (2010): Dynamical stability and phase transition of BeO under pressure, Journal of Applied Physics **107**, 083520.

15. **Ramesh Nath and Dipali Devi** (2009): Venation pattern and shape variation in wing of Antheraea assamensis (Lepidoptera: Saturniidae) of Assam, India, International Journal of Tropical Insect Science **29** (2) 70.

16. **Anjali Baishya and Sabitry Bordoloi** (2009): Ichthyofaunal diversity,Socio-economic status of fisher community, Gears used and techniques of fish catch in the beels of Hajo, Kamrup District, Assam, International Journal of Ecology and Environmental Sciences **35**(1), 77-90.

17. **Susmita Saha and Sabitry Bordoloi** (2009): Ichthyofaunal diversity of two beels of Goalpara District, Assam, India, Journal of threatened Taxa. **1**(4), 240-242.

18. **L. Nzanao Humtsoe and Sabitry Bordoloi** (2009): Study on the torrential catfish Amblyceps apangi Nath&Dey (Teleostei: Amblycipitidae) from Wokha district, Nagaland, Journal of threatened Taxa. **1**(2), 109-113.

19. **Mukut Kalita, K.G. Bhattacharyya and Arundhuti Devi** (2009): Assessment of oil field soil with special reference to the presence of heavy metals: A case study in agricultural soil at Rudrasagar oil field, Assam, Indian Jr. of Environmental Protection **29**(12), 1065 – 1071.

20. **Geetima Deka and Arundhuti Devi** (2009): Soil enzymatic activity as a measure of soil health, Asian Journal of Microbiology Biotechnology & Environmental Science **11**(4), 825 – 830.

21. **Utpal Jyoti Medhi, Anup Kumar Talukdar and Suresh Deka** (2009): Agro-potentiality of lime sludge waste from paper industry, Current Science **79**(10), 1416-1418.

22. **T. Bortamuli, S. Bordoloi, A. Ohler and S. Grosjean** (2010): External morphology, buccopharyngeal anatomy and development rate of the tadpoles of two Asian ranidae (amphibian: Anura), Hylarana humeralis (Boulenger, 1887) and Hylarana leptoglossa (Cope, 1868), Journal of Natural History **44**(7), 421-445.

23. **Mukut Kalita, K.G. Bhattacharyya and Arundhuty Devi** (2010) : Accumulations of heavy metals in some selected plant parts (rice grains, rice husks, papaya fruits and tea leaves) collected from crude oil contaminated

sites in Assam, Jr. Ecology, Environment and Conservation **16** (2), 39-47.

24. **Anjali Baishya, Aparna Dutta and Sabitry Bordoloi** (2010): Morphometry and length-weight relationship of Amblypharyngodon mola (Hamilton-Buchanan, 1822), Indian J. Fish., **57**(1), 87-91.

25. **G. Choudhury and K. Deka** (2009): An $M^X/G/1$ unreliable retrial queue with two phases of service and Bernoulli admission mechanism, Applied Mathematics and Computation **215**, 936.

26. **G. Choudhury** (2009): An $M/G/1$ retrial queue with an additional phase of second service and general retrial time, International Journal of Information and Management Sciences **20**, 1.

27. **G. Choudhury and K. Deka** (2009): A note on $M/G/1$ queue with two phases of service and linear repeated attempts, International Journal of Information and Management Sciences **20**, 547.

28. **G. Choudhury, J.C. Ke and L. Tadj** (2009): The $N-$ policy for an unreliable server with delaying repair and two phases of service, Journal of Computational and Applied Mathematics **231**, 349.

29. **L. Tadj and G. Choudhury** (2009): A quorum queueing system with an unreliable server, Applied Mathematics Letters **22**, 1710.

30. **G. Choudhury and L. Tadj** (2009): An $M/G/1$ queue with two phases of service subject to server breakdown and delayed repair, Applied Mathematical Modelling **33**, 2699.

31. **B.C. Tripathy and B. Sarma** (2009): Vector valued double sequence spaces defined by Orlicz function, Mathematica Slovaca **59**(6), 767.

32. **B.C. Tripathy and B. Hazarika** (2009): Paranormed I-convergent sequences spaces, Mathematica Slovaca **59**(4), 485.

33. **B.C. Tripathy and A. Baruah** (2009): New type of difference sequence spaces of fuzzy real numbers, Mathematical Modelling and Analysis **14**(3), 391.

34. **B.C. Tripathy and A.J. Dutta** (2010): Bounded variation double sequence space of fuzzy real numbers, Computers & Mathematics with Applications **59**(2), 1031.

7.2. In Conferences

1. Sankar Moni Borah, Heremba Bailung and Joyanti Chutia (2009): "OES investigations of reactive dc discharge and its influence on the target for thin film deposition in cylindrical magnetron sputter system", 24th National Symposium on plasma science and technology, "Plasma 2009", Hamirpur, Himachal Pradesh, 8-11 December, 2009.

2. Hemen Kakati, Sankar Moni Borah, Arup Ratan Pal, Heremba Bailung and Joyanti Chutia (2009): "Optical emission spectroscopic study of rf magnetron sputtering plasma for titanium Oxide film deposition", 24th National Symposium on plasma science and technology, "Plasma 2009", Hamirpur, Himachal Pradesh, 8-11 December, 2009.

3. S.K. Sharma and H. Bailung (2009): "Large amplitude ion acoustic solitary waves in multicomponent plasma with negative ions",

International Conference on the Frontiers of Plasma Physics and Technology, Kathmandu, 6 - 10 April, 2009.

4. S.K. Sharma and H. Bailung (2009): "Large amplitude ion acoustic compressive solitary waves in ion beam multicomponent plasma", Summer College on Plasma Physics, ICTP, Trieste Italy, 8 - 28 August, 2009.

5. Hemen Kakati (2009): Nanostructured crystalline alumina thin film as a protective coating deposited by rf magnetron sputtering plasma", Winter School on Physics and Chemistry of Materials, JNCASR, Bangalore, 30 November – 5 December, 2009.

6. H. Kakati, A.J. Choudhary, A.R. Pal, and Joyanti Chutia (2009): "The effect of reactive plasma treatment on dyeing and tensile properties of muga fibres", 24th National Symposium on plasma science and technology, "Plasma 2009", Hamirpur, Himachal Pradesh, 8-11 December, 2009.

7. Neelotpal Sen Sarma, Narendra Nath Dass and Samiul Hoque (2009): "Synthesis and Characterization of poly-cholesteryl 4-pentenoate Liquid Crystalline Polymer and Determination of its Conducting Behaviour", National Seminar on Emerging Trends in Polymer Science and Technology (Poly-2009), Saurastra University, Rajkot, 8-10 October, 2009.

8. Samiul Hoque, Narendra Nath Dass and Neelotpal Sen Sarma (2009): "Synthesis and Characterization of Polymer Liquid Crystal: Cholesteryl acrylate co-polymer", National Seminar on Emerging Trends in Polymer Science and Technology (Poly-2009), Saurastra University, Rajkot, 8-10 October, 2009.

9. Samiul Hoque, Narendra Nath Dass and Neelotpal Sen Sarma (2010): "Synthesis of liquid crystalline polymer and co-polymer of cholesteryl acrylate with 1-hexene, their characterization", 55th Annual Technical Session of Assam Science Society, Gauhati University, Guwahati, 15th February, 2010.

10. K.K. Sharma, J. Kotoky and J.C. Kalita (2010): "Evaluation of Antidermatophytic activity and Toxicity Study of Justicia gendarussa". 55th Annual Technical Session of Assam Science Society, Gauhati University, Guwahati, 15th February, 2010.

11. K.K. Sharma, J. Kotoky and J.C. Kalita (2010): "Antifungal activity and Toxicity Study of Solanum melongena". UGC sponsored national seminar on "Recent Trends in Phytochemical & Phytoprarmaceutical Researchand Future Prospects", Department of Chemistry, Gauhati University, Guwahati, 26th-27th March 2010.

12. T. Mudoi, R. Devi and D.C. Deka (2010): "Estimation of metal contents in a few native fruits of N E India", 55th Annual Technical Session of Assam Science Society, Gauhati University, Guwahati, 15th February, 2010.

13. T. Mudoi, R. Devi and D.C. Deka (2010): "Protective effect of *Musa balbisiana* in oxidative stress induced rats" National Seminar on Recent trends in Phytochemical and Phytopharmaceutical Research and Future

Prospects, Gauhati University, Guwahati, 26-27 March, 2010.

14. Saranga Dutta and Dipali Devi (2010): "Effect of photoperiod on Moth emergences of Antheraea assamensis Helfer", 55th Annual Technical Session of Assam Science Society, Gauhati University, Guwahati, 15th February, 2010.

15. Mamata B. Sharma and Dipali Devi (2010): "Treatment of Muga Silk Fabrics with Biodegumming agent (Kolokhar)", 55th Annual Technical Session of Assam Science Society, Gauhati University, Guwahati, 15th February, 2010.

16. Suresh Deka, Hemen Deka and Neelotpal Sen Sarma (2009): "Phytoremediation of hydrocarbon contaminated soil of oil field situated at Lakowa, Upper Assam, India", Proceedings of the International symposium on Envionmental Pollution, Ecology and Human Health. Department of Zoology, S.N. University, Tirupati, 25-27 July, 2009, Page 79-84.

17. H. Deka, S. Deka and C.K. Baruah (2009): "Biomanagement of water hyacinth (Eichhorina crassipes) through vermicomposting by native earthworm Perionyx sp.", Proceedings of the International symposium on Envionmental Pollution, Ecology and Human Health. Department of Zoology, S.N. University, Tirupati, 25-27 July, 2009, Page 53-55.

18. Sabitry Bordoloi, Rubul Saikia and Budhadev Basumatary (2009): "Field trial of phyto-assisted bioremediation of hydrocarbon contaminated soil using the rhizosphere effects of some grass species", Synergy for Energy Challenges and Opportunities in Northeast East (SECONE), 2009, ITA, Machkwowa, Guwahati, 11 & 12 November, 2009.

19. M. Kalita, K.G. Bhattacharyya and A. Devi (2009): "Environmental risk assessment due to oil field operations: A case study in agricultural soil at Rudrasagar (Assam) oil field area". Synergy for Energy Challenges and Opportunities in Northeast East (SECONE), 2009, ITA, Machkwowa, Guwahati, 11 & 12 November, 2009.

20. G. Deka and A. Devi (2009): "Impact of Refinery effluents on agricultural soil. A case study". International Conference on Ecotoxicology and Environmental Science (ICEES -2009) organized by Indian Institute of Chemical Engineering and Institute of Ecotoxicology and Environmental science, Jadavpur University, Kolkata, 14 & 15 December, 2009.

21. Pranab Sarma, Suresh Deka and Krishnagopal Bhattachayy (2009): "Management of refinery sludge", Synergy for Energy Challenges and Opportunities in Northeast East (SECONE), 2009, ITA, Machkwowa, Guwahati, 11 & 12 November, 2009.

22. H. Deka, S. Deka and C. K. Baruah (2010): "Vermiconversion of wastes of sugarcane (*Saccharum officinarum* L.) by native earth worm *Perionyx sp*.", Proceedings of the 19th All India Congress of Zoology on Biodiversity and Human Welfare, Gauhati

University, Guwahati held on 29-31 December 2008. Page 377-382.

23. Budhadev Basumatary, Rubul Saikia and Sabitry Bordoloi (2010): "*Cyperus brevifolia*: A promising herb for phytoremediation of petroleum hydrocarbon contaminated soil", 55th Annual Technical Session, Assam Science Society, Gauhati University, Guwahati, 15 February, 2010.

24. Sabitry Bordoloi and Mrinal Kumar Das (2010): "A Study on diversity of fish fauna in Tenga River, Arunachal Pradesh", International Conference on Mountain Biodiversity-Conservation and Sustainable utilization entitled, Doon University, Dehradun, Uttarakhand, 13-15 March 2010.

25. Mrinal Kumar Das and Sabitry Bordoloi (2010): "A Study on diversity of fish fauna in Kakarikata beel, Majuli Island, Jorhat, Assam", 55th Annual Technical Session of Assam Science Society, Gauhati University, Guwahati, 15 February, 2010.

26. Anjali Baishya and Sabitry Bordoloi (2010): "Socio-Economic Status of Fishers of Garjan beel of Hajo, a revenue circle of Kamrup district, Assam", National Seminar on Degradation of wetland ecosystem: its impact on the quality of life of the dependant community and on socioeconomic life of fisherman; an environmental impact assessment study in Assam, organized by Kamrup College, Chamata, 22 & 23 January, 2010.

27. G.C. Das, Balen Choudhury and MP Bora (2009): "Evolution of Soliton Radiation Reflecting Phenomena Like of Soliton Burst", 24th National Symposium on plasma science and technology, "Plasma 2009", Hamirpur, Himachal Pradesh, 8-11 December, 2009.

28. G.C. Das, Karabi Devi and A. Nag (2009): "Transient behaviours of soliton dynamics in magnetized plasmas coexisting with negative ions", 24th National Symposium on plasma science and technology, "Plasma 2009", Hamirpur, Himachal Pradesh, 8-11 December, 2009.

29. G.C. Das and Rupa Chakraborty (2009): "Evolution of different nonlinear features of soliton propagation in slow rotating stars", 24th National Symposium on plasma science and technology, "Plasma 2009", Hamirpur, Himachal Pradesh, 8-11 December, 2009.

30. G.C. Das and Rupa Chakraborty (2009): "Formation of Nebulons: A dust cloud around the Moons' atmosphere", 24th National Symposium on plasma science and technology, "Plasma 2009", Hamirpur, Himachal Pradesh, 8-11 December, 2009.

31. G.C. Das and Nirmali Medhi (2009): "Sheath formation in an adiabatic Astro–Dusty-Plasma", 24th National Symposium on plasma science and technology, "Plasma 2009", Hamirpur, Himachal Pradesh, 8-11 December, 2009.

32. G.C. Das and Nirmali Medhi (2009): "Plasma soliton formation in adiabatic dusty", 24th National Symposium on plasma science

and technology, "Plasma 2009", Hamirpur, Himachal Pradesh, 8-11 December, 2009.

33. B.C. Tripathy and Stuti Borgohain (2009): "Some Classes of Difference Sequence Spaces of Fuzzy Real Numbers Defined by Modulus Function", National Meet of Research Scholars in Mathematical Sciences, IIT Roorkee, 19-23 December, 2009.

34. B.C. Tripathy and Stuti Borgohain (2009): "On a Class of Generalized Difference Sequence Spaces Related to ℓ_p Space Defined by Modulus Function" International Conference on Rough Sets, Fuzzy Sets and Soft Computing, Department of Mathematics, Tripura University, Agartala, 5-7 November, 2009.

35. B.C. Tripathy and Stuti Borgohain (2009): "Some Classes of Difference Sequence Spaces of Fuzzy Real Numbers Defined by Modulus Function", National Conference on Recent Trends in Mathematics and its Applications, Department of Mathematics, Gauhati University, Guwahati, 12 & 13 September, 2009.

36. L.B. Mahanta, D.C. Nath and C.K. Nath (2009): "Histogram and Structure based Segmentation and Shape Analysis of Cervical Pap-Smear", 27th Annual conference of Indian Society for Medical Statistics, Banaras Hindu University, Varanasi, 27-29 November, 2009.

37. G.C. Das and Subrata Goswami (2010): "Dynamics of Non-Linear Solitary Wave Propagation in Astroplasmas with Electrons-Positrons-Ions", National Conference on Wave Mech. and Vibration (WMVC-2010), Warangle, A.P., 13-15 March, 2010.

38. B.C. Tripathy and Stuti Borgohain (2010): "Sequence space $m(f, \Phi)^F$ of Fuzzy real numbers with Fuzzy Metric defined by Modulus function", Annual Technical Session of Assam Science Society, 2010, Gauhati University, Guwahati, 15th February, 2010.

39. T.D. Goswami (2010): "Library Portals and Study of its Contents", 7th Convention PLANNER-2010, Tezpur University, Tezpur, Assam, 18-20 February, 2010.

7.3. Publication of Scientific Books

Book Chapters

1. Sabitry Bordoloi and M.M. Borah (2009): Diversity and ecology of amphibian fauna in the wetlands of Arunachal Pradesh, India. **Wetlands of North India. Ecology, Aquatic Bioresources and Conservation.** Akansha Publishing house, Ansari Road, DariyaGanj, New Delhi. Pp 124-145.

2. L. Nzano Humtsoe and Sabitry Bordoloi (2009): Ethnozoological practices of Lotha Naga Tribe of wokha district, Nagaland related to Fish and Fisheries. **Fish and Fisheries in North east India: Recent advances and rebuilding.** Editors: R.N. Bhuyan, D. Ghosh and D. Sarma, Geophil Publishing House, Guwahati.

3. Anjali Baishya and Sabitry Bordoloi (2009): A study on two indigenous techniques of trapping Fishes in the beels of Hajo, kamrup district, Assam. **Fish and Fisheries in North east India: Recent advances and rebuilding.** Editors: R.N. Bhuyan, D. Ghosh and D. Sarma. Geophil Publishing House, Guwahati.

8. Conference/Workshop /Exhibition attended

1. Ms. S.K. Sharma attended the "International Conference on the Frontiers of Plasma Physics and Technology", Kathmandu, 6 - 10 April, 2009.

2. Dr. Munima B Sahariah attended International school on "Materials Modeling from First Principles" organized by International Center for Materials Research at University of California, Santa Barbara, USA from 19th of July 2009 to 1st of August, 2009.

3. Ms. S.K. Sharma attended the "Summer College on Plasma Physics", ICTP, Trieste Italy, 8 - 28 August, 2009.

4. Dr. Neelotpal Sen Sarma and Md. Samiul Hoque attended the "National Seminar on Emerging Trends in Polymer Science and Technology (Poly-2009)", Saurastra University, Rajkot, 8-10 October, 2009.

5. Dr. H. Bailung, Dr. A.R. Pal, Dr. H. Kakati, Mr. M. Deka, Mr. S.M. Borah and Mr. A.J. Chowdhury attended the "National Symposium on Plasma Science and Technology-2009" held at NIT, Himachal Pradesh, India in December 2009.

6. Mr. H. Kakati attended the "Winter School on Physics and Chemistry of Materials" held at JNCASR, Bangalore in November – December 2009.

7. Dr. Neelotpal Sen Sarma and Md. Samiul Hoque attended the "55th Annual Technical Session of Assam Science Society", Gauhati University, Guwahati, 15th February, 2010.

8. Dr. Dipali Devi attended the workshop at Indian Institute of Entrepreneur Development organized by CSB as a resource person and participated at panel discussion on 20th May 2009.

9. Dr. J. Kotoky joined as invitee and Dr. Dipali Devi as invited panelist at the Seminar on "International Property Rights Awareness and Sensitization Programme for Micro, Small and Medium enterprises (MSME) held on 28 August 2009 at Guwahati organized by CII, Guwahati with Ministry of Micro, Small & Medium enterprises, Govt. of India.

10. Dr. Rajlakshmi Devi attended National Seminar on Biodiversity Spectrum of North east India organized by Department of Zoology, Arya Vidhyapeeth College, Guwahati in collaboration with the Zoological society of Assam on 18-19th September 2009.

11. Dr. Dipali Devi and Mr. Saranga Dutta participated at the workshop from 21st to 25th October 2009 on Wildlife Conservation

sponsored by DST, GOI held at Gauhati Univercity.

12. Dr. Dipali Devi and Mr. Saranga Dutta attended the workshop on GC-MS at DFS at Kahilipara on 11th November 2009 sponsored by DFS & Thermo fisher Pvt. Ltd.

13. Dr. J. Kotoky participated in the workshop on GC-MS/MS held at NEIST, Jorhat on 13th November 2009, sponsored by M/S. Thermo Fisher Scientific India Pvt. Ltd, Kolkata.

14. Dr. J. Kotoky attended an Scientific talk on "Function & Dysfunction of our immune system: Novel concepts, challenges and hopes for tomorrow" Dr. Srinivas V. Kaveri, Director of Research in INSERM Unite 681, Institute des Cordeliers, Paris, on 15th December 2009 at Gauhati University, sponsored by INSERM Unite 681, Institute des Cordeliers, Paris, & Biotechnology Department Gauhati University, Assam.

15. Dr. J. Kotoky and Dr. Rajlakshmi Devi attended the International Seminar on Molecular Modeling and Drug Design sponsored by M/S. Schrodinger, UK held at NEIST, Jorhat on 17th December 2009.

16. Dr. J. Kotoky attended the international conference on "Chemical Biology for Discovery; Perspective and Challenges" organized by CDRI, Lucknow under the aegis of the Indian society of Chemists and Biologists" from February 15th to 18th 2010.

17. Dr. Dipali Devi attended International conference on chemical Biology at CDRI, Luckhow during 15th to 18th Jan 2010 organized by Chemical Society of India.

18. Dr. Dipali Devi attended a daylong seminar at NABARD on 20th January 2010 on State Credit System and Micro Finance.

19. Dr. Dipali Devi, Mr. Saranga Dutta and Ms. Mamata B. Sharma attended the "55th Annual Technical Session of Assam Science Society", Gauhati University, Guwahati, 15th February, 2010.

20. Dr. Suresh Deka and Mr. Hemen Deka attended the International Symposium on Envionmental Pollution, Ecology and Human Health. Department of Zoology, S.N. University, Tirupati, held on July 25-27, 2009.

21. Mr. Hemen Deka, Ms. Rashmi Rekha Saikia and Mr. Budhadev Basumatary, have completed UGC sponsored Research Methodology course for Ph. D. Scholars conducted by the Academic Staff College, Gauhati University from October 2009 to 1st November 2009.

22. Dr. Sabitry Bordoloi, Dr. Suresh Deka, Dr. A. Devi, Ms Rashmi Rekha Saikia, Mr. M. Kalita, Mr. Rubul Saikia and Mr. Budhadev Basumatary attended the National level conference on "Synergy for Energy-Challenges and Opportunities in North East India (SECONE-09)" organized by Oil India Ltd on 11th and 12thNovember 2009 at ITA Cultural Complex, Machkhowa, Guwahati.

23. Mr. Rubul Saikia and Mr. Budhadev Basumatary attended A DBT Program Support

Project Sponsored Short Term Course on, "Molecular tools for crop improvement" from 17th to 21st November 2009.

24. Ms. Anjali Baishya and Dr. Sabitry Bordoloi attended the National Seminar on Degradation of wetland ecosystem: its impact on the quality of life of the dependant community and on socioeconomic life of fisherman; an environmental impact assessment study in Assam, organized by Kamrup College, Chamata on 22nd and 23rd January 2010.

25. Dr. Suresh Deka attended the Advanced Techno-Management Programme for Middle Level Scientists. Sponsored by the DST Govt. of India held at Administrative Staff College of India from January 04 to February 05, 2010.

26. Mr. Mrinal Kumar Das, Ms. Sonali Borpatra Gohain and Mr. Budhadev Basumatari attended the 55th Annual Technical Session, Assam Science Society at Gauhati University, Guwahati on 15th February, 2010 and presented a paper.

27. Mr. Mrinal Kumar Das attended the International Conference on Mountain Biodiversity- Conservation and Sustainable utilization entitled, from 13-15 March, 2010 held at Doon University, Dehradun, Uttarakhand.

28. Ms. Stuti Borgohain attended the National Conference on "Recent Trends in Mathematics and its Applications, held at Department of Mathematics Gauhati University, Guwahati, ASSAM during 12 & 13 September, 2009.

29. Ms. Stuti Borgohain attended the International Conference on "Rough Sets, Fuzzy Sets and Soft Computing" held at Department of Mathematics, Tripura University, Agartala, TRIPURA during 5-7 November, 2009.

30. Mr. Chandan Nath attended the 27th Annual conference of Indian Society for Medical Statistics held at Banaras Hindu University, Varanasi during 27-29 November, 2009.

31. Ms. Stuti Borgohain attended the workshop "Workshop on Operator Theory, Advanced Training in Mathematics School" organized by the Institute of Mathematics and Applications, Bhubaneswar held during December 7-12, 2009.

32. Mr. Balen Choudhury, Ms. Karabi Devi, Ms. Rupa Chakraborty and Mr. Nirmali Medhi attended the 24th National Symposium on "Plasma Science & Technology", held at NIT, Hamirpur, Himachal Pradesh during 8-11 December, 2009.

33. Ms. Stuti Borgohain attended the National Meet of Research Scholars in Mathematical Sciences, held at IIT Roorkee during December 19-23, 2009.

34. Ms. Stuti Borgohain attended the Annual Technical Session of Assam Science Society, 2010, held at Gauhati University, Guwahati, Assam on February 15, 2010.

35. Mr. T.D. Goswami, Asst. Librarian attended training programme on "Library e-Resources and Hands on ISI Web of Science and web EndNote Software- tools for Managing References", organized by Bose Institute, Kolkata under CSIR-DST e-Journal Consortia, held at Bose Institute, Kolkata on June 18th 2009.

36. Mr. T.D. Goswami, Asst. Librarian attended the 7th Convention, PLANNER-2010 on "Re-engineering of Library and Information Services in Digital Era", jointly organized by INFLIBNET Centre, Ahmedabad and Tezpur University, Tezpur during 18-20th February 2010.

9. Ph.D. Produced/ Awards

1. Mr. Heman Kakati was awarded Ph.D. degree by Gauhati University for his thesis "Discharge and deposition characteristics of radio frequency magnetron plasma" under the supervision of Prof. Joyanti Chutia and Dr. H. Bailung in 2009.

2. Ms. Shabeena Yasmin has been awarded Ph.D. degree by Gauhati University for her thesis entitled "Lime Sludge Waste of Paper Mill as an Alternative Source of Liming in Fish Farming" under the supervision of Dr. Suresh Deka and Prof. Amalesh Dutta of Department of Zoology, Gauhati university in 2009.

3. Ms. Karabi Devi was awarded Ph.D. degree by Gauhati University for her thesis "Coherent structures of nonlinear waves in plasmas" under the supervision of Professor G.C. Das in 2010.

4. Prof. Joyanti Chutia, Director, IASST received the prestigious **women scientist award** 2009 from the Mother Teresa women University, Chennai.

5. Dr. Devasish Chowdhury, Assistant Professor, Material Science Division has been awarded **IUSSTF fellowship 2009** to do advanced research at University of Illinois at Urbana-Champaign, USA by Indo-US Science & Technology Forum (IUSSTF), New Delhi from October 2009 to April 2010.

6. Mr. Nirab Chandra Adhikary has been awarded the **Postdoctoral fellowship by Yokohama University**, Japan from March 2010 to February 2011.

7. Best Poster Awarded to Ms. S.K. Sharma at the International Conference on the Frontiers of Plasma Physics and Technology, Kathmandu 6-10 April, 2009.

8. Dr. A.R. Pal has been recognized as a Ph. D. Guide under Gauhati University, India.

9. Dr. (Mrs.) R. Devi has been recognized as a Ph. D. Guide under Gauhati University, India.

10. Research Collaborations

Plasma Physics Group has the collaboration with

1. Prof. D.S. Patil
BARC, Mumbai
Area of research: Plasma Processing

2. Dr. K.S. Dhathathreyan
CFCT, Chennai
Area of research: Fuel Cell

3. Dr. Y. Nakamura
Yokohama National University
Area of research: Dusty plasma

Prof. Narendra Nath Dass has collaboration with:

1. Prof. Aradhana Dutta
Deptt. of Chemistry, Dibrugarh University, Assam, India.
Area of Research- Polymer Science

2. Prof. Ravi K. Khardekar
Centre for Advanced Technology, Indore, India.
Area of Research- Laser Polymer

3. Prof. K.G. Bhattacharyya
Gauhati University, Guwahati, India
Area of Research- Physical Chemistry

4. Prof. H.C. Pants
Visiting Scientist, BARC, Mumbai
Area of Research- Laser Polymer

5. Dr. M. Sukla
Scientist, Purnima Lab, BARC, Mumbai
Area of Research- Laser Polymer

Dr. Neelotpal Sen Sarma has collaboration with:

1. Prof. O.K. Medhi
Gauhati University, Guwahati, India
Area of Research- Physical Chemistry

2. Prof. J.N. Ganguli
Gauhati University, Guwahati, India
Area of Research- Inorganic Chemistry

3. Prof. H.P. Sarma
Gauhati University, Guwahati, India
Area of Research- Environmental Science

Dr. Devasish Chowdhury has collaboration with:

1. Prof. John Rogers
Department of Material Science Engineering
University of Illinois at Urbana Champaign
USA
Area of Research- carbon nanotube sensor devices

2. Prof. Jacob Sagiv
Department of Material and Interface
Weizmann Institute of Science, Rehovot
Israel
Area of Research: Self-assembled monolayer

3. Prof. Arun Chattopadhyay
Centre for Nanotechnology, Indian Institute of Technology, Guwahati, India
Area of Research- Nanoscience and Technology

Dr. J. Kotoky has collaboration with:

1. Dr. S.K. Maulik
Additional Prof. Department of Pharmacology, AIIMS, New Delhi.

2. Dr. S. Bhan
Assistant Prof., Department of Biochemistry, NEHU, Shillong.

3. Prof. D.C. Deka
Department of Chemistry, Gauhati University, Guwahati.

4. Prof. D.K. Sharma
Department of Zoology, Gauhati University, Guwahati.

Dr. Sabitry Choudhury Bordoloi has collaboration with

1. Professor Alain Dubois
Muséum National d'Histoire Naturelle
Département Evolution et Systématique,
UMR 7205 CNRS Origine, Structure et
Évolution de la Biodiversité, 25 rue Cuvier,
CP 30, 75005 Paris, France
2. Professor Annemarie Ohler
Muséum National d'Histoire Naturelle
Département Evolution et Systématique,
UMR 7205 CNRS Origine, Structure et
Évolution de la Biodiversité , 25 rue Cuvier,
CP 30, 75005 Paris, France
Area of Research- Amphibian evolution and Systematics

3. Dr. Stephane Grosgean,
Muséum National d'Histoire Naturelle
Département Evolution et Systématique,
UMR 7205 CNRS Origine, Structure et
Évolution de la Biodiversité , 25 rue Cuvier,
CP 30, 75005 Paris, France
Area of Research- Tadpole Taxonomy

4. Dr. Balwant Singh
Associate Professor, Faculty of Agriculture, food and Natural Resources, The University of Sydney, Sydney, NSW 2006, Australia
Area of Research- Soil Chemistry

5. Dr. Hari Prasad Sarma
Reader, Department of Environmental Science, Gauhati University.
Area of Research- Environmental Chemistry

6. Prof. Aparajeeta Borkotoki
Professor, Department of Zoology, Gauhati University
Area of Research- Cell Biology

Dr. Suresh Deka has collaboration with

1. Prof. I.M. Banat
University of Ulster Northern Ireland, U. K.
Area of Research- Microbiology, Biosurfactant, Molecular Biotechnology
2. Dr. Banwari Lal
Director, Environment and Industrial Biotechnology Division, the Energy Resource Institute (TERI), New Delhi
Area of Research- Environmental Biotechnology

3. Prof. K.G. Bhattacharyya
Department of Chemistry, Gauhati University
Area of Research- Environmental Chemistry, Physical Chemistry

4. Prof. A.K. Talukdar
Department of Chemistry, Gauhati University
Area of Research- Environmental Chemistry

5. Prof. C.K. Baruah
Rtd. Prof. and Head, Department of Botany, Department of Chemistry, Gauhati University
Area of Research- Ecology and Environmental Botany

6. Dr. Manab Deka
Department of Biotechnology
Gauhati University

Area of Research- Industrial Microbiology. Molecular biology

Dr. Arundhuti Devi has collaboration with

1. Prof. K.G. Bhattacharyya
Department of Chemistry, Gauhati University
Area of Research- Environmental Chemistry, Catalysis

2. Dr. Ashwani Kumar
Industrial Toxicology Research Centre
Lucknow 226 001
Area of Research: Environmental Biotechnology

Dr. Binod Chandra Tripathy has collaboration with:

1. Prof. B. Choudhary
Department of Mathematics; University of Botswana, BOTSWANA.
Area of Research: Orlicz Type Sequences

2. Prof. Mikail Et
Department of Mathematics; Firat University; TURKEY.
Area of Research: Sequences of Fuzzy Numbers

3. Prof. Ayhan Esi
Department of Mathematics; Adiyaman University; 02040 ADIYAMAN; TURKEY
Area of Research: Sequences of Fuzzy Numbers

4. Dr. N. Subramanian
Department of Mathematics; SASTRA University; Tanjore-613 402; INDIA.
Area of Research: Double Sequence Spaces Defined by Orlicz Functions

5. Dr. C. Murugesan
Department of Mathematics; Satyabhama University; Chennai-613 402; INDIA.
Area of Research: Double Sequence Spaces Defined by Orlicz Functions

Dr. Gautam Choudhury has collaboration with:

1. Prof. Jau-Chuan Ke
Department of Applied Statistics, National Taichung Institute of Technology, No.129, Section 3, Sanmin Road, Taichung 404, Taiwan, Republic of China
Area of Research- Control of queues

2. Prof. L.Tadj
Department of Management and e-Business, American University in Dubai, United Arab Emeratus.
Area of Research- Control of queues & Vacation Models

3. Prof. Kamel Rekab
Department of Mathematics and Statistics, University of Missouri-Kansas City, USA Area of Research- Physical Chemistry
Area of Research- Control of queues

Dr. (Mrs) Lipi B. Mahanta has collaboration with:

1. Prof. Dilip C. Nath
Dept. of Statistics, Gauhati University Guwahati – 781 014, India
Area of Research- Distribution Theory

2. Prof. D. Dutta Majumder
Professor Emeritus, Indian Statistical Institute, Kolkata, Director and Secretary, Institute of Cybernetics Systems and Information Technology (ICSIT), Kolkata – 700018, West Bengal

Area of Research- Image Processing, Pattern Recognition, Learning Models

2. A.C. Kataky
Director, B. Barooah Cancer Research Institute, Guwahati
Area of Research- Image Processing, Pattern Recognition

11. Lectures delivered on invitation

1. Prof. Joyanti Chutia delivered a Plenary Talk *PLASMA-2009* held at the National Institute of Technology (NIT), Hamirpur.

2. Dr. H. Bailung delivered lectures on plasma diagnostics in Three day school on foundations of plasma physics and technology for young researchers of North-East India held at Dibrugarh University.

3. Dr. A.R. Pal delivered an Invited Talk at *PLASMA-2009* held at the National Institute of Technology (NIT), Hamirpur.

4. Dr. A.R. Pal delivered a Talk in *Regional Conference on the Recent Trends in Chemistry* held at Dharmanagar College, Dharmanagar, Tripura.

5. Dr. Sabitry Choudhury Bordoloi delivered A talk entitled "Conservation of amphibian in relation to habitat characteristics" in Department of Science and Technology, Science and Engineering Research Council sponsored 3rd School in herpetology (2-17 November, 2009) held at Donbosco Auditorium, Guwahati.

6. Dr. Sabitry Choudhury Bordoloi delivered Key note address on Degradation of wetlands: its impact on ecology, biodiversity and socio-economic condition of fisherman community" in the U.G.C. sponsored National seminar on "Degradation of wetland ecosystem : its impact on the quality of life of the dependant community and on socioeconomic life of fisherman; An environmental impact assessment study in Assam" organized by Kamrup College, Chamata on 22nd and 23rd January 2010.

7. Dr. Sabitry Choudhury Bordoloi delivered a talk on "Waste Management Mechanism- the Role of Corporate Sectors" on 8th January 2010 at Assam Institute of Management, Guwahati.

8. Dr. Sabitry Choudhury Bordoloi Delivered a talk on "Amphibians: indicator species of global climatic change" in the international conference on global warming & climate change –vis-a-vis Management of Natural Resources in North East India on 22nd March 2010.

12. Other activities

1. Dr. H. Bailung chaired a session at *PLASMA-2009* held at the National Institute of Technology (NIT), Hamirpur.

2. Dr. Neelotpal Sen Sarma chaired the session–III in the *National Seminar on Emerging*

Trends in Polymer Science and Technology (Poly-2009) held at Saurastra University, Rajkot.

3. Dr. J. Kotoky has given an Antifungal Herbal skin Ointment/cream for limited Clinical trial to Govt. Ayurvedic College & Hospitals, Guwahati, Assam & Regional Research Institute (Ay), Assam and Jorhat Medical College, Jorhat, Assam.

4. An animal house is setting up having all those unique facilities required to rear laboratory animals. Right now numbers of experimental animals like albino mice, albino rats, guinea pig, rabbit etc are available in the house and we are conducting our experiment with these animals. The process for the registration of Animal House is going on with the 'Committee For the Purpose of Control and Supervision of Experiments on Animals' (CPCSEA), Government of India, Animal Welfare Division.

5. A medicinal plant garden is being set up for not only to preserve some important medicinal plants of this region but also to do research work. All the plant species were authentically identified by expert taxonomists, labeled and in many cases their therapeutic values in curing different diseases are also highlighted

6. Dr. Sabitry Choudhury Bordoloi Chaired technical session II of the seminar entitled "Degradation of wetland ecosystem: its impact on the quality of life of the dependant community and on socioeconomic life of fisherman; an environmental impact assessment study in Assam" Organized by Kamrup College, Chamata in January, 2010.

7. Dr. Sabitry Choudhury Bordoloi was one of the penalists in the International conference on global warming & climate change –vis-a-vis Management of Natural Resources in North East India in March, 2010.

8. Dr. B.C. Tripathy was appointed as a *Nomination Council Member* for *Mathematical Sciences* of the INFOSYS PRIZE of the *INFOSYS SCIENCE FOUNDATION* for the years 2009 and 2010.

9. Dr. B.C. Tripathy was appointed as a Reviewer for "*Mathematical Reviews*" of *American Mathematical Society*, *U.S.A*.

10. Dr. B.C. Tripathy was a Reviewer of "*Zentralblatt Math*", GERMANY.

11. Dr. B.C. Tripathy is an Editorial Board member of the periodical "*Journal of Advanced Research in Pure Mathematics*" USA.

12. Dr. B.C. Tripathy is an Editorial Board member of the periodical "*Journal of Advanced Research in Fuzzy and Uncertain Systems*" USA.

13. Dr. B.C. Tripathy is an Editorial Advisory Board Member of the journal "*Turkish Journal of Science and Technology*", Firat University, TURKEY.

14. Dr. B.C. Tripathy is an Editorial Board member of the periodical "*Far East Journal of Mathematical Sciences*" (Pushpa Publishing House), ALLAHABAD.

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

16. Dr. B.C. Tripathy is an Editorial Board member of the periodical "*Advances in Mathematical Sciences Journal*", ALLAHABAD.

17. Dr. B.C. Tripathy Chaired 2 (two) paper presentation sessions in the National Conference on "*Recent Trends in Mathematics and its Applications*" organized by the Department of Mathematics, Gauhati University, held in September 2009.

18. Dr. G. Choudhury is the Editorial Board member of "*Far East Journal of Theoretical Statistics*" (Pushpa Publishing House), ALLAHABAD.

19. Dr. G. Choudhury was appointed as a Reviewer for "*Mathematical Reviews*", *American Mathematical Society*, *U.S.A*.

20. Dr. G. Choudhury a Guest Editor of "*Quality Technology and Quantitative Management*" for the Special issue "*Management Policies of Queueing Control*" FCU Press, Taiwan.

13. Seminar / Training / Lecture/ Exhibition Organized

1. Three weeks training program has been arranged for M.Sc. (Physics) final semester students of Gauhati University and Cotton College during Feb 8-28, 2010.

2. Dr. Neelotpal Sen Sarma was an Organizing Committee member of the National Seminar on "Photonics and Quantum Structure, NSPQS-2009" organized by the Department of Physics, Tezpur University, held during November 4-6, 2009.

3. Prof. T.K. Dey of IIT, Kharagpur visited IASST on 24th November 2009 and delivered a talk on Cryogenic Engineering.

4. Prof. Sibaji Raha, Director, Bose Institute, Kolkata visited IASST on 22nd February 2010 and delivered a talk on "Searching for the Mysteries of the Universe-Science of LHC at Cern".

Dr. Sivaji Raha visited the IASST lab.

5. Dr. B.C. Tripathy was an organising Committee member of the National Conference on "*Recent Trends in Mathematics and its Applications*" organized by the Department of

Mathematics, Gauhati University, held during September 12 &13, 2009.

6. **Meeting with the Delegates from NABARD:**

A group of delegates lead by the DGM from NABARD visited Seri-biotech unit on 26th March, 2010 in coordination with the ongoing project 'Development of a package for seed production of Muga Silkworm' under the Rural Innovative Fund, sponsored by NABARD.

The Delegates

Prof. Joyanti Chutia, Director, IASST addressing the delegates

Dr. Dipali Devi, Asst. Prof., IASST giving the presentation

A formal meeting was held to welcome them and to make aware of the kind of work this unit has been carrying on. Prof. Joyanti Chutia, Director, IASST welcomed the delegates and Dr. Dipali Devi gave a presentation comprising each and every aspect of the Silkworm Industry, which proved to be a very interactive one. The role of NABARD in developing this sector was also discussed in detail. The delegates also visited the laboratory, museum and the food plant garden.

Visit to the food plant garden

Exhibition Report-1

Machinery Mart 2010 *9-13th March, 2010* Maniram Dewan Trade Centre, Guwahati

View of the stall

The Seri- biotech unit of IASST participated at the Machinery Mart held from 9-13th march at the MDTC, Guwahati under the banner of NABARD.

Display of various silkworm species indigenous to the North East Region of India, Grainage Technology, Testing of Purity of Silk and natural dyeing on Eri Silk were the main highlights of the stall.

Owing to the economic importance of the silkworm, the precious gift of nature, various types of preserved specimens like cocoons, silk moths, larvae and fibers were displayed along with posters stressing on the need to conserve the indigenous silk moths of this region. Grainage technology was depicted using photographs of the different stages from preservation of cocoons to hatching of eggs.

A simple and instant chemical test for purity of silk and to identify different fibers and fabrics has been demonstrated to the visitors which is helpful in identifying adulteration of Muga and Tasar silk fabric which is a major challenge for costliest muga silk, the G.I product of Assam.

Interaction with Visitors regarding silk testing

North East region is producing plenty of Eri silk which are coarse, off white in colour therefore are economically not so significant and aesthetically not so appealing. As the artificial colours have been banned in many western countries, it is advantageous to dye the eri fiber and fabric with natural dye locally available in this region and to earn foreign money exporting the low cost eri fiber. Some avenues have been shown photographically for applying natural dyes e.g. - lac, marigold, heena, jackfruit, indigo etc on eri silk (fabric and fiber).

Inquisitive visitors at the stall

As the venue (MDTC) of the exhibition is situated at a remote part of the city and the theme of the exhibition was headed as "Machinery Mart" the visitors interested in silk were less. However, those visited the stall responded with positive feedback as they found the exhibits very interesting and informative. People related with the silk industry were very inquisitive about the grainage technology and the natural dyeing. Common people found the testing of silk very useful.

The exhibition was a success and hopefully benefited the visitors.

Exhibition report-2

Ideas to Action: Let us grow with innovation

The Seri-biotech unit of IASST participated in the Science Exhibition, 'Ideas to Action: Let us grow with innovation' organized by ASTEC from 3rd to 7th Feb, 2010. Different types of silkworms, cocoons, larvae and their food plants along with grainage methods, fiber & fabrics were displayed through live and preserved specimens, photographs and posters.

IASST's stall

Owing to the economic importance of silk, a chemical test to identify silk (Muga and Tasar) was also performed which became the main attraction of the stall. The exhibitors were very enthusiastic about identifying silk and to recognize adulterated silk. Emphasis was also laid on the conservation of the wild silk moths confined to the N.E region of India and making people aware about the importance of these silk moths and the consequences if they are to perish.

Identification of silk

Organizers visiting the stall

A view of the exhibitors

LECTURE ARRANGED

Dr. Ramesh Kumar Aggarwal, CCMB, Hyderabad delivered a talk entitled "A brief overview of different DNA marker techniques: Tools for detecting genetic variation" on 20th September 2009 at IASST Auditorium

He spoke in detail about the structure and facilities available at CCMB, Hyderabad. Advantages and disadvantages of different DNA markers. Utility of this type of studies in taxonomy, evolution, Species determination etc.

14. Colloquium Organized at IASST

Name of the speakers	Address	Title of the Talk	Date
Dulal Chandra Boruah	S.R.F Life Sciences Division , IASST	The effect of leaf extract of Clerodendron colebrookianum (CC) Walp on lipid profile, lipid peroxidation and antioxidant status on oxidative stress induced rats	30/04/09
Arundhuti Devi	Assistant Professor Resource Management & Environment Division, IASST	Metal speciation in crude oil contaminated soil system	12/06/09
Hemen Kakati	SRF Material Sciences Division, IASST	Deposition of nanostructured crystalline alumina film on bell metal at low temperature by rf magnetron sputtering	31/07/09
Hemen Deka	JRF Resource Management & Environment Division, IASST	A study on utilization of Bio-wastes for production of vermicompost	23/12/09

VISITORS

Dr. R.K. Agarwal, CCMB, Hyderabad delivering lecture at IASST.

Dr. Gopinathan visited Microbiology laboratory on 3rd November 2009.

Mr. K.P. Pandian JS&FA, DST, GoI visit IASST on 7th September 2009.

Dr. Sivaji Raha visited the RM&ED Museum on 22nd February 2010.

Naturalist Ms. Jerelinn Schefield from New York, observing silkworm biodiversity on 18th September 2009.

Group of artisans from Dibrugarh visiting Seri-biotech Laboratory on 22nd March 2010.

Institutional manpower

Director

Prof. Joyanti Chutia, Ph. D, FNASc

Scientists & Staff

Material Sciences Division

Dr. Heremba Bailung
Associate Prof, Head (i/c)

Prof. Narendra Nath Dass
Honorary Professor

Dr. Neelotpal Sen Sarma
Assistant Professor

Dr. Arup Ratan Pal
Assistant Professor

Dr. Devasish Chowdhury
Assistant Professor

Mr. Sankar Moni Bora	SRF
Mr. Hemen Kakati	SRF
Ms. Sumita K Sarmah	SRF
Md. Samiul Haque	SRF
Mr. Manoj K Deka	JRF
Ms. Porimita Saikia	JRF
Ms. Dolly Gogoi	JRF
Mr. Lakhinandan Goswami	JRF

Project Scientists:

Dr. Munima Bora Saharia
DST-Fast Track Scientist

Technical Staff:

Mr. Nirab Ch. Adhikery	Technical Officer B
Mr. Krishna Kanta Swargiary	Technician
Mr. Niren Sarma	Technical Helper
Mr. Bipul Kr. Das	Technical Helper

Life Sciences Division

Dr. Jibon Kotoky
Associate Prof, Head (i/c)

Dr. (Mrs.) Dipali Devi
Assistant Professor

Dr. (Mrs.) Rajlakshmi Devi
Assistant Professor

Mr. Rupak Sarma	Project Assistant
Mr. Dulal Chandra Baruah	SRF
Mr. Kaustav Kamal Sharma	JRF
Ms. Tiluttama Mudoi	JRF
Mr. Bijit Talukdar	JRF
Ms. Phulmani Choudhury	JRF
Mr. Saranga Dutta	JRF
Ms. Mousumi Saikia	JRF
Mr. Ramesh Nath	Teacher Fellow
Mr. Sarangapani Saikia	Teacher Fellow

Mr. Krishna Kanta Sarma Field Assistant

Technical Staff:

Ms. Julie Bordoloi Technical Assistant

Mr. Subrata Goswami Technical Assistant

Mr. Bolin Das Technical Helper

Mr. Tarun Talukdar Technical Helper

Mr. Sabin Kalita Technical Helper

Resource Management &Environment Division

Dr. (Mrs) Sabitry Choudhury Bordoloi
Associate Prof, Head (i/c)

Dr. Suresh Deka
Associate professor

Dr. (Mrs.) Arundhuti Devi
Assistant professor

Ms. Rashmi Rekha Saikia JRF

Mr. Hemen Deka SRF

Mr. Mrinal Kr.Das JRF

Mr. Rubul Saikia JRF

Mr. Budhadev Basumatary JRF

Ms. Anjali Baishya Project Scientist

Ms. Chatoan Tesia JRF

Ms . Sonali Barpatra Gohain JRF

Mr. Pinku Bora Project Assistant

Technical Staff:

Mr. Manmohan Huzuri Technical Assistant

Mr. Madan Kalita Technical Helper

Mr. Dhaneswar Boro Field Attendant

Mr. Ailek Chakhap Field Attendant

Mathematical Sciences Division

Dr. Binod Chandra Tripathy
Associate Professor,Head (i/c)

Prof. Jyoti Prasad Medhi
Honorary Professor

Prof. Ganesh Chandra Das
Honorary Professor

Dr. Gautam Choudhury
Assistant Professor

Dr. (Mrs.) Lipi B. Mahanta
Assistant Professor

Ms. Stuti Borgohain Women Scientist

Ms. Rupa Chakraborty JRF

Mr. Chandan Kumar Nath JRF

Ms. Pallavi Saikia JRF

Ms. Nandini Sarma Research Officer
Ms. Geetima Deka Research Assist.
Ms. Tanushree Deb Roy Research Officer
Ms. Rangmili Gogoi Dutta Research Assist.

Mr. Balabhadra Pathak Peon-I

Internet Service Centre

Mr. Anupam Barman
Assistant Professor and In-charge

Mr. Niranjan Bhagaboti
Technical Officer B

Library & Information Centre

Mr. Tarini Dev Goswami
Assist. Librarian

Mr. Kumud Baishya Assistant

Mrs. Sarala Deka Peon

Administrative Staff

Dr. Heremba Bailung Registrar (i/c)

Mr. Ganesh Ch. Bhuyan
Finance & Accounts Officer

Mr. Rajesh Sharma PRO

Mr. Prabodh Kr. Deka Section Officer

Mr. Suresh Ch. Sarma Section Officer

Mr. Rabin Ch. Kalita Sr. Superintendent

Mr. Ramen Mahanta Sr. Superintendent

Mrs. Saraswati Bora Sr. Superintendent

Mr. Montu Deka Junior Engineer

Mr. Dwijen Ch. Deka Assistant

Mr. Diganta Das Assistant

Mr. Prabhat Ch. Barma Assistant

Mr. Gora Gupta Assistant

Mr. Nimai Hazam Driver

Mr. Phatik Baishya Driver

Mr. Babul Ch. Deka Peon

Mr. Umesh Ch Deka Peon

Mr. Lakshmi Kanta Saud Peon

Mrs. Madhabi Das Peon

Mr. Nripen Ch. Goswami Peon

Mr. Satish Ch. Das Peon

Mr. Haren Medhi Peon

Mr. Ratul Baishya Peon

Mr. Binoy Kr. Choudhury Peon

Mr. Pradip Das Peon

Mr. Srikanta Baishya Peon

Mr. Munna Basfor Sweeper

Technical Staff

Ms. Juri Pathak Technical Officer A

Mr. Munindra Singh Technical Assistant

Mr. Madhu Ram kalita Technical Helper

Personal Profile of Faculty Members

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Dr. Devasish Choudhury	Asst. Prof.	devasishc@gmail.com	09401454696

Annual accounts

M. SAQUEI & CO.
CHARTERED ACCOUNTANTS

ARSHAD SAQUEI, M.Com., F.C.A., DISA (ICA)
REEFAT SAQUEI, M. Com., F.C.A.

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: 2131239
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GUWAHATI - 781 001

AUDITOR'S REPORT
TO THE MEMBERS OF
INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY, GUWAHATI

1. We have examined the attached balance sheet of **INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY, GUWAHATI** as at 31st March, 2010 and the Income and Expenditure Account for the year ended on that date annexed thereto, both of which we have signed under reference to this report. These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these financial statements based on our audit.

2. We conducted our audit in accordance with auditing standards generally accepted in India. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

3. We further report that:-

   (a) We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purposes of our audit.

   (b) In our opinion, proper books of account have been kept by the Institute so far as appears from our examination of such books.

   (c) The Balance Sheet and the Income and Expenditure Account referred to in this report are in agreement with the books of account.

   (d) In our opinion and to the best of our information, and according to information given to us, and subject to the notes on accounts, the said accounts give the information in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India–

      i) in the case of the Balance Sheet, of the state of affairs of the Institute as at 31st March, 2010; and
      ii) in the case of the Income and Expenditure Account, of the income and expenditure of the Institute for the year ended on that date.

For M. Saquei & Co.,
Chartered Accountants

Reefat Saquei
Partner
(Membership No. 058118)

M. SAQUEI & CO. GUWAHATI Chartered Accountants

Guwahati; 5th August, 2010

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI

BALANCE SHEET AS AT 31ST MARCH 2010

(AMOUNT IN RS.)

	SCHEDULE	CURRENT YEAR	PREVIOUS YEAR
CAPITAL FUND AND LIABILITIES			
CAPITAL FUND	1	11,02,43,315.96	-
RESERVES AND SURPLUS	2	-	-
EARMARKED / ENDOWMENT FUNDS	3	-	-
SECURED LOANS AND BORROWINGS	4	-	-
UNSECURED LOANS AND BORROWINGS	5	-	-
DEFERRED CREDIT LIABILITIES	6	-	-
CURRENT LIABILITIES AND PROVISIONS	7	3,77,32,665.62	-
TOTAL		14,79,75,981.58	-
ASSETS			
FIXED ASSETS	8	11,42,25,489.00	-
INVESTMENTS - FROM EARMARKED / ENDOWMENT FUNDS	9	-	-
INVESTMENTS - OTHERS	10	23,49,608.00	-
CURRENT ASSETS, LOANS AND ADVANCES	11	3,14,00,884.58	-
TOTAL		14,79,75,981.58	-
SIGNIFICANT ACCOUNTING POLICIES	16		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	17		

In terms of our separate report of even date.

For M. Saquei & Co.,
Chartered Accountants

Reefat Saquei
Partner

M. SAQUEI & CO. ★ GUWAHATI ★ Chartered Accountants

Guwahati; 5th August 2010

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2010

(AMOUNT IN RS.)

	SCHEDULE	CURRENT YEAR	PREVIOUS YEAR
INCOME			
Grants	12	4,44,26,223.38	-
Interest Earned	13	5,28,544.00	-
Other Income	14	12,83,758.00	-
TOTAL		4,62,38,525.38	-
EXPENDITURE			
Expenditure on Grants	15	4,62,38,525.38	-
Depreciation		-	-
TOTAL		4,62,38,525.38	-
BALANCE BEING SURPLUS / (DEFICIT)		-	-
PRIOR PERIOD ADJUSTMENTS		-	-
BALANCE BEING SURPLUS / (DEFICIT) TRANSFERRED TO CAPITAL FUND		-	-
SIGNIFICANT ACCOUNTING POLICIES	16		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	17		

In terms of our separate report of even date.

For M. Saquei & Co.,
Chartered Accountants

Reefat Saquei
Partner

M. SAQUEI & CO. ★ GUWAHATI ★ Chartered Accountants

Guwahati; 5th August 2010

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2010

(AMOUNT IN RS.)

	CURRENT YEAR	PREVIOUS YEAR
SCHEDULE 1 - CAPITAL FUND:		
As per last Account	8,90,68,650.96	-
Add: Contributions towards Capital Fund	2,11,74,665.00	-
	11,02,43,315.96	-
Add / (Deduct): Surplus / (Deficit) transferred from Income and Expenditure Account	-	-
TOTAL	11,02,43,315.96	-

	CURRENT YEAR	PREVIOUS YEAR
SCHEDULE 2 - RESERVES AND SURPLUS:	-	-
TOTAL	-	-

	CURRENT YEAR	PREVIOUS YEAR
SCHEDULE 3 - EARMARKED / ENDOWMENT FUNDS:	-	-
TOTAL	-	-

	CURRENT YEAR	PREVIOUS YEAR
SCHEDULE 4 - SECURED LOANS AND BORROWINGS:	-	-
TOTAL	-	-

	CURRENT YEAR	PREVIOUS YEAR
SCHEDULE 5 - UNSECURED LOANS AND BORROWINGS:	-	-
TOTAL	-	-

	CURRENT YEAR	PREVIOUS YEAR
SCHEDULE 6 - DEFERRED CREDIT LIABILITIES:	-	-
TOTAL	-	-

M.SAQUEI & CO. GUWAHATI Chartered Accountants

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2010

(AMOUNT IN RS.)

SCHEDULE 7 - CURRENT LIABILITIES AND PROVISIONS:	CURRENT YEAR	PREVIOUS YEAR
A. CURRENT LIABILITIES:		
Unutilised Grant-in-aid	2,85,74,031.62	-
Other Current Liabilities	91,40,569.00	-
Earnest Money	18,065.00	-
TOTAL (A)	3,77,32,665.62	-
B. PROVISIONS:	-	-
TOTAL (B)	-	-
TOTAL (A+B)	3,77,32,665.62	-

M. SAQUEI & CO. ★ GUWAHATI ★ Chartered Accountants ★

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI

SCHEDULES FORMING PART OF THE BALANCE SHEET AS AT 31ST MARCH 2010

(AMOUNT IN RS.)

SCHEDULE 8 - FIXED ASSETS

DESCRIPTION	GROSS BLOCK				DEPRECIATION			NET BLOCK	
	COST / VALUATION AS ON 01.04.2009	ADDITIONS DURING THE YEAR	DEDUCTIONS DURING THE YEAR	COST / VALUATION AS ON 31.03.2010	AS AT 01.04.2009	FOR THE YEAR	AS AT 31.03.2010	AS AT 31.03.2010	AS AT 31.03.2009
A. FIXED ASSETS									
1. BUILDING AND SITE DEVELOPMENT	7,83,82,400.00	1,24,120.00	-	7,85,06,520.00	-	-	-	7,85,06,520.00	-
2. EQUIPMENTS	1,06,35,600.00	1,69,12,976.00	-	2,75,48,576.00	-	-	-	2,75,48,576.00	-
3. VEHICLES	50,000.00	10,38,194.00	-	10,88,194.00	-	-	-	10,88,194.00	-
4. FURNITURE AND FIXTURES	8,40,225.00	7,54,930.00	-	15,95,155.00	-	-	-	15,95,155.00	-
5. LIBRARY	29,07,400.00	25,79,644.00	-	54,87,044.00	-	-	-	54,87,044.00	-
TOTAL	9,28,15,625.00	2,14,09,864.00	-	11,42,25,489.00	-	-	-	11,42,25,489.00	
PREVIOUS YEAR	-	-	-	-	-	-	-		-
B. CAPITAL WORK-IN-PROGRESS								-	-
TOTAL								11,42,25,489.00	-

M. SAQUE & CO. GUWAHATI Chartered Accountants

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2010

	CURRENT YEAR	PREVIOUS YEAR
SCHEDULE 9 - INVESTMENTS FROM EARMARKED / ENDOWMENT FUNDS:	-	-
TOTAL	-	-

	CURRENT YEAR	PREVIOUS YEAR
SCHEDULE 10 - INVESTMENTS - OTHERS:		
In Term Deposits	23,49,608.00	-
TOTAL	23,49,608.00	-

	CURRENT YEAR		PREVIOUS YEAR	
SCHEDULE 11 - CURRENT ASSETS, LOANS AND ADVANCES:				
A. CURRENT ASSETS:				
Cash Balances in Hand	10,072.00		-	
Bank Balances:				
With Scheduled Banks on Current / Deposit / Savings Accounts	1,52,21,610.58	1,52,31,682.58	-	-
B. LOANS, ADVANCES AND OTHER ASSETS:				
Advances and other amounts recoverable in cash or in kind or for value to be received:				
On Capital Account -				
Advance for Equipments	1,43,84,364.00		-	
Advance for Consumables	4,31,453.00		-	
Advance for Library	13,53,385.00	1,61,69,202.00	-	-
TOTAL		3,14,00,884.58		-

M. SAQUEI & CO. GUWAHATI Chartered Accountants

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI

SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2010

(AMOUNT IN RS.)

	CURRENT YEAR		PREVIOUS YEAR	
SCHEDULE 12 - GRANTS:				
Irrevocable Grants	9,41,74,920.00		-	
	9,41,74,920.00		-	
Deduct: Transferred to Capital Fund (Grants utilised for capital expenditure)	2,11,74,665.00		-	
	7,30,00,255.00		-	
Deduct: Unutilised Grant carried forward	2,85,74,031.62	4,44,26,223.38		-
TOTAL		4,44,26,223.38		-

(AMOUNT IN RS.)

	CURRENT YEAR		PREVIOUS YEAR	
SCHEDULE 13 - INTEREST EARNED:				
On Savings Accounts with Scheduled Banks		5,28,544.00		-
TOTAL		5,28,544.00		-

	CURRENT YEAR		PREVIOUS YEAR	
SCHEDULE 14 - OTHER INCOME:				
Other Income		12,83,758.00		-
TOTAL		12,83,758.00		-

	CURRENT YEAR		PREVIOUS YEAR	
SCHEDULE 15 - EXPENDITURE ON GRANTS ETC.:				
Expenditure against Grants for Specific Projects / Schemes:				
Salary		3,51,09,875.00		-
Contingencies		30,44,581.00		-
Honorarium		1,71,225.00		-
Training		13,420.00		-
Travel		11,17,554.00		-
Consumables		35,10,905.00		-
Overhead		8,44,919.00		-
Works and Services		13,94,504.00		-
Green House		65,149.00		-
Financial Assistance		9,61,400.00		-
Bank Charges		4,993.38		-
TOTAL		4,62,38,525.38		

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI
ANNEXURE - I
SCHEDULE OF PROJECT-WISE RECEIPTS FOR THE YEAR 2009-2010

INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY
PASCHIM BORAGAON, GARCHUK, GUWAHATI
ANNEXURE - II

SCHEDULE OF PROJECT-WISE PAYMENTS FOR THE YEAR 2009-2010

(AMOUNT IN RS.)

Sl. No	Name of Project	Workshop	Building Approach Road	Salary	Contingencies	Furniture & Fixture	Vehicle	Equipments	Honorarium	Training	Works & Services	Travel	Consumable	Library	Advance	Overhead	Green-House	Outstanding Liability	Earnest Money	Financial Assistance	Bank Charges	Security Deposit	Group Gratuity	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Basic Experiment Plasma	0.00	0.00	1,93,200.00	17,716.00	0.00	0.00	0.00	0.00	0.00	0.00	14,775.00	29,090.00	0.00	0.00	54,190.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,08,971.00
2	CSIR (Mr. H. Kakoti)	0.00	0.00	2,01,600.00	20,001.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,21,601.00
3	CSIR (Mr. S.M. Borah)	0.00	0.00	1,54,350.00	15,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,69,350.00
4	System of Curves	0.00	0.00	1,65,600.00	49,925.00	0.00	0.00	0.00	0.00	0.00	0.00	50,000.00	16,625.00	0.00	0.00	63,710.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,45,860.00
5	Study on Polymer Flim	0.00	0.00	0.00	20,000.00	0.00	0.00	13,15,000.00	0.00	0.00	0.00	19,605.00	1,00,000.00	0.00	0.00	99,275.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15,53,880.00
6	Untied Fund	0.00	1,05,920.00	0.00	0.00	0.00	0.00	6,36,412.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7,42,332.00
7	Dusty Plasma	0.00	0.00	1,68,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34,583.00	60,563.00	0.00	0.00	27,566.00	0.00	48,480.00	0.00	0.00	0.00	0.00	0.00	3,39,192.00
8	Muga Silk Fibre (RF)	0.00	0.00	2,29,133.00	14,675.00	0.00	0.00	0.00	0.00	0.00	0.00	41,052.00	22,761.00	0.00	0.00	21,000.00	0.00	2,72,571.00	0.00	0.00	0.00	0.00	0.00	6,01,192.00
9	Effect of Leaf Extract	0.00	0.00	2,07,000.00	27,144.00	0.00	0.00	0.00	0.00	0.00	0.00	30,000.00	47,984.00	0.00	0.00	11,072.00	0.00	1,77,498.00	0.00	0.00	0.00	0.00	0.00	5,00,698.00
10	A.B. Intio	0.00	0.00	2,40,000.00	13,521.00	0.00	0.00	0.00	0.00	0.00	0.00	12,670.00	0.00	0.00	0.00	60,331.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,26,522.00
11	Selected Fruits	0.00	0.00	1,93,200.00	27,042.00	0.00	0.00	0.00	0.00	0.00	0.00	29,436.00	95,592.00	0.00	0.00	55,594.00	0.00	87,379.00	0.00	0.00	0.00	0.00	0.00	4,88,243.00
12	NABARD	0.00	0.00	1,92,000.00	66,528.00	0.00	0.00	3,02,755.00	0.00	0.00	0.00	33,938.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5,95,221.00
13	Surface Self Assembly	0.00	0.00	0.00	15,277.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,74,676.00	0.00	0.00	75,937.00	0.00	90,229.00	0.00	0.00	0.00	0.00	0.00	3,56,119.00
14	Liquid Crystilline	0.00	0.00	2,03,800.00	20,226.00	0.00	0.00	0.00	0.00	0.00	0.00	39,227.00	72,494.00	0.00	0.00	27,018.00	0.00	20,000.00	0.00	0.00	0.00	0.00	0.00	3,82,765.00
15	SERC School Project	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,30,370.00	0.00	0.00	0.00	0.00	0.00	4,30,370.00
16	Field Application	0.00	0.00	3,78,056.00	32,374.00	0.00	0.00	0.00	0.00	0.00	0.00	64,842.00	72,905.00	0.00	0.00	1,50,000.00	65,149.00	0.00	0.00	0.00	0.00	0.00	0.00	7,63,326.00
17	Nutritional Status	0.00	0.00	1,31,371.00	46,079.00	0.00	0.00	0.00	0.00	0.00	0.00	36,846.00	11,970.00	0.00	0.00	18,800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,45,066.00
18	3rd Edition	0.00	0.00	15,000.00	15,750.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,87,975.00	0.00	0.00	0.00	0.00	0.00	2,18,725.00
19	DST General (Govt. of India)	0.00	18,200.00	2,84,05,018.00	24,85,782.00	7,54,930.00	10,38,194.00	1,43,28,809.00	1,71,225.00	13,420.00	13,94,504.00	5,70,242.00	25,91,883.00	23,80,310.00	1,61,69,202.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7,03,21,719.00
20	Broad Spectrum	0.00	0.00	1,04,411.00	23,559.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46,548.00	0.00	0.00	12,422.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,86,940.00
21	Plant Diversity & Environment	0.00	0.00	9,570.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9,570.00
22	Bharalu River	0.00	0.00	17,253.00	21,320.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5,015.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43,588.00
23	Phytoremidiation	0.00	0.00	1,62,600.00	8,900.00	0.00	0.00	0.00	0.00	0.00	0.00	16,968.00	48,839.00	0.00	0.00	35,046.00	0.00	63,292.00	0.00	0.00	0.00	0.00	0.00	3,35,645.00
24	Rotating Stars	0.00	0.00	3,41,280.00	3,495.00	0.00	0.00	90,000.00	0.00	0.00	0.00	14,897.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,49,672.00
25	Bio-surfacetarce	0.00	0.00	1,65,600.00	7,980.00	0.00	0.00	0.00	0.00	0.00	0.00	18,483.00	59,114.00	0.00	0.00	0.00	0.00	3,32,679.00	0.00	0.00	0.00	0.00	0.00	5,83,856.00
26	Aquitic Bio-Deversity	0.00	0.00	2,25,600.00	27,398.00	0.00	0.00	1,00,000.00	0.00	0.00	0.00	15,040.00	20,000.00	0.00	0.00	41,560.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,29,598.00
27	Micro- Bial Bio-Diversity	0.00	0.00	3,44,204.00	50,000.00	0.00	0.00	1,00,000.00	0.00	0.00	0.00	60,000.00	30,000.00	0.00	0.00	50,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,34,204.00
28	Artificial Colour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	Govt. of Assam DST	0.00	0.00	25,00,037.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,38,973.00	6,500.00	9,61,400.00	4,993.38	7,310.00	81,328.00	39,00,541.38
30	Ichthyo Founal Diversity	0.00	0.00	41,992.00	4,889.00	0.00	0.00	0.00	0.00	0.00	0.00	4,950.00	4,861.00	0.00	0.00	5,383.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	62,075.00
31	Studies on Sequence Space	0.00	0.00	1,20,000.00	10,000.00	0.00	0.00	40,000.00	0.00	0.00	0.00	10,000.00	5,000.00	0.00	0.00	31,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,16,000.00
32	Retrial Model	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31,052.00	0.00	0.00	0.00	0.00	0.00	31,052.00
33	Education (2008-2009)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,99,334.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,99,334.00
34	Beel Bio- Diversity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,80,931.00	0.00	0.00	0.00	0.00	0.00	3,80,931.00
35	Up-Grading IASST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,33,964.00	0.00	0.00	0.00	0.00	0.00	2,33,964.00
	TOTAL Rs.	0.00	1,24,120.00	3,51,09,875.00	30,44,581.00	7,54,930.00	10,38,194.00	1,69,12,976.00	1,71,225.00	13,420.00	13,94,504.00	11,17,554.00	35,10,905.00	25,79,644.00	1,61,69,202.00	8,44,919.00	65,149.00	26,95,393.00	6,500.00	9,61,400.00	4,993.38	7,310.00	81,328.00	**8,66,08,122.38**

M. SAQUE & CO. GUWAHATI Chartered Accountants

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