ANNUAL REPORT

1993 - 94

INSTITUTE OF ADVANCED STUDY IN
SCIENCE AND TECHNOLOGY
Jawaharnagar, Khanapara,
Guwahati - 781 022

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Contents

Foreword

It is my proud privilege to present the Annual Report of the Institute of Advanced Study in Science and Technology for the year 1993-94. During the year the IASST has made spectacular progress in the projects such as Plasma Physics, Muga Silk Worm, Medicinal Herbs, Impact of Oil Exploration activities on the rice soil field of Upper Assam and the availability and requirement of S &T Manpower for the next 20 years in Assam. The results of the investigations made in different field, have been published in the form of research paper which have appeared in the National and International Journals of repute. This year altogether 35 papers have been published from this institute. Of the project taken up, the IASST has achieved spectacular break through in Muga rearing project. The hitherto believed myth of impossibility of rearing Muga Worm indoors has been belied through the evolution of new technique for the first time in the history of Muga Silk rearing under the guidance of Dr. J. N. Talukder, Hony, Prof. IASST.

The technology has successfully been transferred from Lab. to land in a training camp held in a tribal village named Chakabaha under Boko Block, Kamrup District. The villager have shown keen interest in rearing Muga Worms Indoors and they have seen a ray of hope of economic prosperity by taking up to indoor rearing technique.

The Scientists of the IASST had participated in National International seminars/conferences/workshops presenting papers.

We gratefully acknowledge the kind gesture of the Govt. of Assam for the allotment plot of Land measuring 60 bighas at west Boragaon at greater Guwahati. The jungles on the land had been cleared up and it was levelled by Bulldozer. In the mean time step, have been initiated to prepare a master plan for the IASST buildings and the Campus.

The IASST is pleased to offer sincere thanks and gratitude to the Ministry of Science & Technology Govt. of India for approving project proposal on "development of the Mathematical Sciences Division" and sanctioning an amount of Rs. 55. 50 Lakhs for the purpose for the 5 years. Favourable responses have been received from the Govt. of India for other projects submitted to the Ministry. The Institute of Advanced Study in Science and Technology is waiting for favourable response for the other projects submitted to the Ministry of Forest & Environment, Govt. of India and the Indian Council of Medical Research.

Our sincere thanks are due to the Ministry and all Members of DSTE, Govt. of Assam, the state planning & Dev. Department Govt. of Assam, The Ministry Revenue Assam, the Planning Commission, Govt. of India and the member of the Council of the IASST for the Consultent and active Co-operation rendered for the Development of the IASST.

GUWAHATI
Date : 15.4.94

Dr. P. Goswami,
Director,
IASST.

RESEARCH & DEVELOPMENT ACTIVITIES

Plasma Physics :

Research activities have been carried out both in theoretical and experimental Plasma Physics. A well equipped laboratory for studying basic properties of Plasmas has been set up with the joint financial assistance of the Department of Science, Technology & Environment, Govt. of Assam and the Department of Science and Technology, Govt. of India and the generous gifts of sophisticated scientific equipments from the Institute of Space and Astronautical Science, Japan through the international collaboration of Prof. Y. Nakamura of the said Institute.

Automation of the Laboratory :

Automation of the laboratory has been performed successfully by using a Machintosh (power book 140) computer with the help of GPIB (General purpose Interface Bus) via a SCSI (Small computer system Interface) port. Fast & automatic acquisation of data in any desired range of parameter from digitizing instruments like digitizing oscilloscope, programmable spectrum analyzer & storing them in proper location in the computer for analysis are being done. The Machintosh computer using a data acquisation routine (developed by one of our research worker in collaboration with ISAS, JAPAN) does the job facilitating fast & accurate on-line experiments which are being done presently in the double plasma device which had already been installed four years back.

Experimental Research works :

In order to identify the periodic bifurcation & chaos in an ion-beam Plasma, the poincare sections (one of the important tools for identication) has been observed on oscilloscope using a differential circuit. Poincare section reveals the structural characteristics of the phase space trajectories of the bifurcation chaos showing finite number of dots for periodic orbits & strange attractor for chaotic orbits constiting of infinitte number of layers. Periodic windows are observed in ion-beam plasma system under the influence of external periodic oscillation on the spontaneous Plasma oscillation. We also have observed a new phenomenon period substracting with the variation of the frequency of the driver signal within the suppression range of internal oscillation. The influence of negative ion on periodic bifurcation in ion beam Plasma has been investigated. It is found that in presence of negative ions the threshold for bifurcation cascade & chaotic behaviour is larger compared to the case of Plasma with electrons positive ions. In such a Plasma with contaminating negative ions, the non-linear propagation ion-acoustic waves have also been studied. Experimental results reveal that these waves can modulationally be made unstable for wide range of wave number when negative ions are fixed at a critical value as predicated by theory.

Theoretical Research works :

Theoretical research works have been carried out in nonlinear phenomena of Plasmas Double layers, Jeans instability of a dusty Plasma

and transport properties of Plasmas. An attempt has been made to derive a modified Kadomtsev-Petviashvili (mK-P) equation to highlight the impact of the trapped electrons on nonlinear wave propagation in plasmas by using the perturbation technique. In particular, the formation of Spiky solitary waves, double layers and explosive modes as well as other possible progressive modes of relevance to the satellite observations in interplanetary space have been discussed. The present theoretical studies sieved many more nonlinear waves reflecting the chaotic notion in the dynamical systems.

It is well known that the propagation of small amplitude ion-acoustic waves in isothermal plasmas with either negative ions or multiple electrons reveal various phenomena of solitary waves in plasmas. But such observations, in relation to the satellite observations, exhibit various chaotic motions that meet in the interplanetary space and lead to consider a generalised multicomponent plasma consisting of especially free and trapped electrons. By using the reductive porturbation technique in multi -dimensional scale, the system of basic equation is transferred to a well known Kadomtsev -Petviashvili equation. The solitary wave solution shows that the nonlinearity in the dynamical system could support double layers and collapsible waves in certain circumstances and giving the sequences of various waves which are observable in interplanetary space lying within the reach of satellite observations.

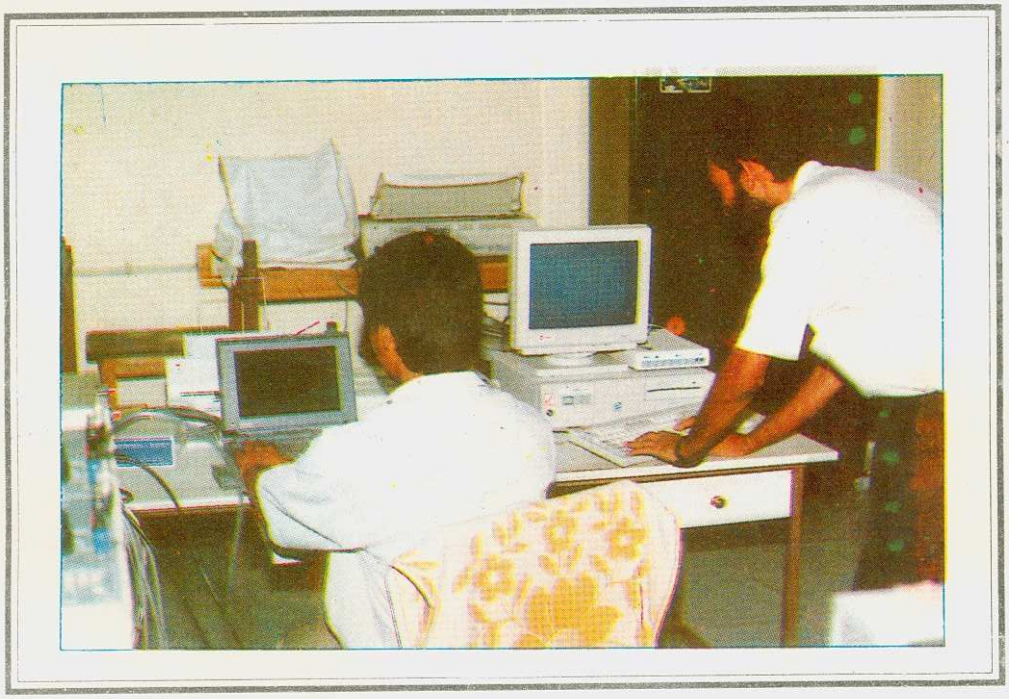
The stability of Kadomtsev-Petviashvili (K-P) Solitary waves in multi-dimensional space-plasmas has been studied. It is found to exist both compressive and rarefactive solitary waves bifurcated by the critical densities appeared at the zeros of the nonlinear co-efficient in K-P wave equation. Because of zeros, there appears the singularities in soliton propagation and leads to derive, with a modified RPT, a modified K-P (mK-P) equation which in fact exhibits not only the compressive and rarefactive solitary waves but also shows the formation of shock waves. The analyses on soliton propagation are also derived by Sagdiv potential confirming all those solitary waves observed by the augmentation of K-P equation in the Plasmas. The main emphasis has been given to highlight the soliton, which exhibits, even though there are having the singularities as well as shock, stability of waves that found to be independent of nature of the solitary waves.

An attempt has been made to highlight the probable relativistic effect on the various solitary wave propagations and the corresponding double layers in the interplanetary space. It is highly expected that, as and when, the electron resonant effect together with its derivation from the isothermality is stronger than that of the isothermal electrons, various salient features of solitary waves could be elated and as a whole there might be chaotic behaviour on the existence of various solitary waves.

Study of linear and nonlinear stages of the Jeans instability of charged dust grains with mass m_d and charge q_d in the regime $Gm^2_d / q^2_d \simeq o(1)$ has been pursued. Various conditions for stable electrostatic levitation, condensation and dispersion of grains in the plasma background have been obtained. The nonlinear solutions show that there is a condensation of grains even when the effect of self gravity is annuled by self electrostatic repulsion.

Attempt has been made to find out the role of the effective collisionless damping mechanism of the dust drift mode in an inhomogeneous

1. Plasma Physicists engaged in carrying out experiments.



2. Computer Analysis of Experimental data on chaos in Plasma in Progress.

magneto dusty plasma. Physically the tempo-spatial dependence of the dust charge fluctuation dynamics produces compressibility and leads to the damping of the dust drift mode. This novel dissipative mechanism is unlikely in normal plasmas.

Formation of a neutral induced weak shock structure in a weakly ionised magnetoplasma has been analytically investigated . Using the reductive perturbation method, basic dynamical equations of a three component (electron, ion and neutral atoms) plasma has been reduced to a well known Burger's equation which can support a weak shock solution. Its stationary and initial value solutions have been derived to describe the characteristics of the weak shock profile. Asymptotic behaviour of the Burger's solution results in a saw-tooth structure which has practical implication to predict the nonlinear steepened structure of the night time irregularity in lower portion of the earth's ionosphere. Accordingly, it is suggested that the observation of saw tooth shape of night time irregularity at 92 Km (i) could be attributed to the nonlinear saturation of the NILF mode instability as proposed by Dwivedi and Das (ii) However, their exact experimental verification requires more data on night-time irregularity in the mesosphere and thermosphere (80-95 Km) for a wide range of scale sizes extending upto about a Km and above.

i) Sinha, H.S.S. (1976); Studies in equatorial aeronomy (thesis submitted to Gujarat University, Ahmedabad).

ii) Dwivedi, C.B. and Das, A.C (1992) Neutral induced low frequeny instability in a weakly ionised magnetised plasma, Planet. Space Sci. 40,119

The scale invariance technique has been employed to discuss the η_i -driven turbulent transport under a new fluid model developed by Kim et al (1). The analysis based on the invariance principle of the basic governing equations under the set of group similarity transformations reveals that in the non-dissipative case the scaling behaviour of the energy transport remains unchanged as compared to that derived by Connor (2) under the traditional fluid model. As a consequence, it is inferred that the contribution of ion-polarisation drift to the kinetic energy in the energy balance relation (which makes the new model different from those of the others) does not lead to any qualitative change in the transport mechanism and also the power scaling laws of the associated heat transport. However, in the dissipative case, which has not been discussed earlier additional constraints on the power scaling laws of the transport properties are imposed due to the dissipative mechanism in the basic governing equations.

1) Kim, C.B., Horton. W. and Hamaguchi, S. 1993 Phys. Fluids B5 1516.

2) Connor, J. W. 1986 Nucl. Fusion 26, 193.

Analytical analysis of the nonlinear saturation of the R-T instability has been carried out and appropriate physical model has been proposed for the saturation mechanism. Stationary wave formalism and initial value approach have been applied for the analysis. In the former case a linear superposition model has been forwarded to understand the nonlinear saturation process, whereas in the later, the mode-mode coupling model. Parallel friction due to shear

effect and ion polarisation drift are identified as the basic sources of the nonlinearity. Utility of the results in laboratory plasmas has been highlighted.

An investigation has been made on the effect of dust charge fluctuation dynamics on the linear and nonlinear behaviour of low frequency electrostatic perturbations in dusty plasmas.

The investigation reports the existence of a one dimensional (n-d) shock profile for a weakly nonlinear modified acoustic-like/dust-acoustic waves. Here, unlike in the conventional plasma systems the dissipative effect to balance the nonlinear steepening arises self consistently due to the dust charge fluctuation dynamics in response to the collective plasma oscillations. The possibility of occurrence of the other localised coherent structures like dissipative / dispersive solitons in higher order solutions has been highlighted.

While carrying out these problems, effort has been made to encourage the interdisciplinary/inter-institutional collaborative activities. The author has developed a collaborative research programme with the scientists of the leading plasma institute of the country, Institute for plasma Research, Bhat, Gandhinagar, Gujarat in some of the fore front areas of the research like exotic plasmas (dusty plasmas) and tokamak plasmas. In continuation of these collaborative programmes a problem entitled " Buoyant force induced instability in a plasma with dust contamination " is under the process of preparation and a few more problems related with transport phenomena in magnetically confined plasmas are at the stage of concept formation and mathematical formulation.

Life Sciences :

Presently, research activities in the fields of Bio-Chemistry and Muga Silk Worm are being carried out in the Life Science Division.

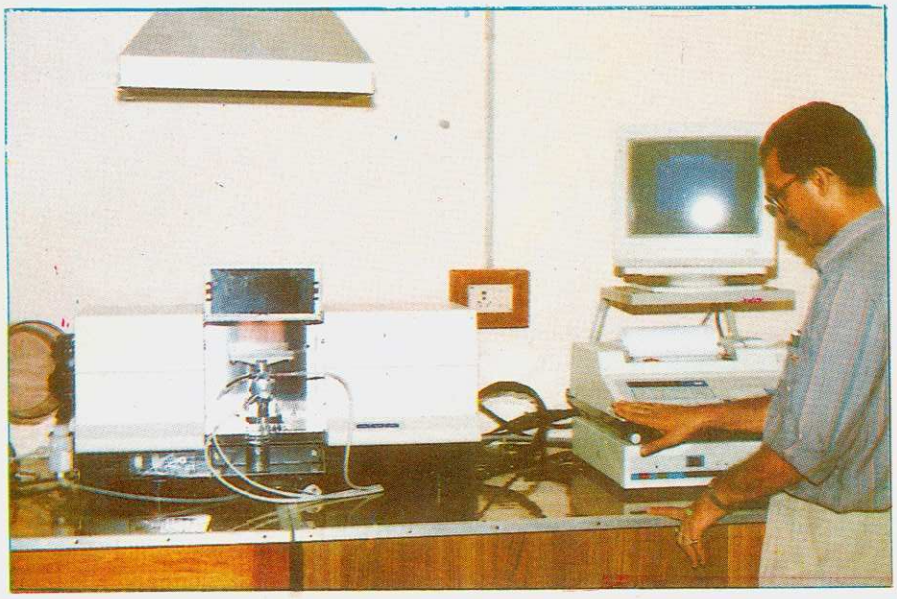
Bio-Chemistry :

Research activities in the projects undertaken in the year 1992-93 are being continued in the Life Science Division.

During the year of 1993-94, further detail study on the Bioassay guided phytochemical investigation of the medicinal plants has been taken up.

Five important phytoconstituents from the plant undertaken has been analysed by utilizing the techniques like IR, UV, 400 MH_z ^{1}H- NMR, HR-MS, GC, techniques in collaboration with Prof. Ze-Nai CHEN of Shanghai University of China. One of the compounds isolated is triacontane, a long chain hydrocarbon and another aliphatic alcohal octacosanol was isolated from the plant. Presence of palmitic Acid, $C_{16}H_{32}$ 0_2 (M^+= 256), m.p. 62° C and stearic Acid $C_{18}H_{36}O_2$ (M^+= 284), m.p. 70°C was identified and these compounds were separated with much trouble. Another steroidal constituent of the plant, Clerosterol, (24 S) Stigmasta-5, 25 (27) - di ene - 3 β - ol) along with a steroidal glycoside which is of interesting nature has been isolated from this plant. This compound is believed to be of novel type. The chemical characters of the compound are being examined in collaboration with Prof. Ze-Nai CHEN of CHINA.

The biological potency of the different rections is also being invesigated in the experimental animal. It has been observed that prolong administration of the aqua extract did not



3. Scientists of Life Science Division conducting experiments in Atomic Absorption spectrophotometer.

4. Field demonstration of indoor rearing of Muga silk worms at Village Chakabaha, Boko.

produce any harmful effect in the animals and the maximum hypolipidaemic effect has been observed at the end of Ist week of administration of the extract, hypolipidaemis was not altered after prolonged administration of the extract. No significant alteration in the blood glucose level was noted earlier, the findings have been further confirmed noting no alteration in the circulating insulin measured by using the isotope in the gama-counter. The group of animals fed with high fat diet fed with the aqua extract of the plant and significant hypolipidaemic effect after administration of aqua extract of the plant. The biological effect of the ether, and alcohol extracts of the plant are now being administered in the experimental animal by administering the measured quantity of the extract, initially hepotoxic effects were noted after administration of either extract. It was thought that the effect might be due to ether alone which might remain as impurity in the extracts, this conception was investigated administering ether alone and some hepatotoxic effect was noted (Photos 1 + 2 - 3). The extract was thereafter further purified, the purified extract is not being administered to see the biological effect.

The effect of the aqua extract was also tried on the fungi grown in the test tubes & till now sufficient data have not been obtained for final conclusion. Efficacy of certain essential oil has been studied against white Mascardine fungus. B. Bassiana causing " Bombax Moril disease in silkworm.

During the period the following projects have been under taken in the life Sciences Division -

i) Dietory factors co-relating Cholesterol, triglycerides, alkaline phosphotase and atherosclerosis.

ii) Effect of hydrocarbon carcinogens of Retinol Binding protein.

iii) Hepatoprotective actions of terminalia Chebula.

iv) Malnutrition and reproduction Hormones.

Muga Silk Worn :

Of the projects taken up, the IASST has achieved spectacular breakthrough in Muga rearing project. The hitherto believed myth of impossibility of rearing Muga Worm indoors has been belied through the evolution of a new technique for the first time in the history of Muga Silk rearing under the guidance of Dr. J. N. Talukdar, Hony Professor, IASST.

The technology has successfully been transferred from Lab. to Land in a training camp held in a tribal village named Chakabaha under Boko Block, Kamrup District. The villagers have shown keen interest in rearing Muga Worm Indoors and they have seen a ray of hope of economic prosperity by taking up to indoor rearing technique, which is sure of success and not exposed to vicissitudes of nature, if proper efforts are under taken to popularise the technique among the rural masses.

Mathematical sciences :

The Mathematical Science Division is engaged in carrying out research in Mathematics and Statistics.

MATHEMATICS : The focus of activities in Mathematical sciences has been given in four research areas such as (1) Infinite Simple Groups, (2) Fuchsian groups, (3) Application of

group theory to Plasma Physics and (4) Near-rings.

(1) Infinite simple groups :

The search for a finitely presented infinite simple group which can be realised as a free product with amalgamation of two free groups of finite rank amalgamating subgroups of finite index in them continues. Though simplicity is still difficult to obtain, we have succeeded in constructing infinite families of such finitely presented amalgamated free products which are very close to being simple.

For example, an infinite family of groups $G = H_u \quad K$ is constructed, each of which is such that

(i) G has no finite quotients, and

(ii) U.N. = G for all non-trivial normal subgroups N of G.

The only thing that we futher need to show to prove simplicity of this class of groups is that the normal closure of any non-identity element of the amalgamated subgroup U is the whole of G. The combinatorial and graph theoretic techniques applied to resolve this problem do not give any conclusive results. Still we believe that our analysis so far is a significant step in the quest for new families of infinite simple groups.

(2) Fuchsian groups :

A Fuchsian triangle group F is an infinite insoluble group generated by 3 elements X_1, X_2 and X_3 of finite order l, m and n respectively with defining relations.

$$X^l_1 = X^m_2 = X^n_3 = X_1 X_2 X_2 = 1$$

Provided

$$\frac{1}{l} + \frac{1}{m} + \frac{1}{n} < 1$$

Given any three positive integers l, m and n satisfying the above inequality, we tried to discover some conditions under which F has solvable surface- kernal quotients. An exhaustive analysis of all the possible classes of such groups has given us a complete list of groups for which such quotients exist. When these quotients are finite, we have also determined the general of the compact Riemann surfaces having these groups as antomorphism groups. We have also formulated a method Whereby a conntably infinite family of solvable surface-kernal quotients may be obtained from a single such quotient.

(3) Applications of Group Theory to Plasma Physics :

A beginning has been made in trying to apply group- theoretic techniques in resolving questions in other areas. Working with a colleague at the Plasma Physics Division of the Institute, we have tried to apply the invariance principle of the basic governing equations under a set of group similarity transformations to analyse the scaling laws for plasma transport due to η_i Driven turbulence under a new fluid model.

(4) Near-rings :

Dr. B. K. Tamuli, Professor and Head (Retd.), Deptt. of Mathematics, Gauhati University joined th IASST as Honorary Professor on Ist October, 1993, to compile a book on Nearings incorporating current research results and adopting a new approach.

The book is expected to enable the beginner

to steer clear of the details and take him straight to the higher regions of the subject and to ensure that the reader does not lose sight of the wood because of the trees of the four chapters into which the book is likely to be divided, the first one (Basic Concepts) has been more or less completed. Some portions have already been tried out. In this chapter he has defined left nearrings and right nearrings and has shown that one type can be converted into the other. The chapter introduces zero identity and idempotent elements and nearfields and defines subnearrings, ideals and quotient nearrings.

The very important concept of homomorphism is then introduced. The basic theorems are given. The Correspondence theorem (the socalled second Isomorpism Theorem) is proved. Every epimorphism

f : M -> N

from a left nearring M to a left nearring N induces a one - one correspondence between the set X of right ideals L of M containing Ku f and the set Y of right ideals K of N.

He gives a simple proof of the nearring analogue of cayley's embedding theorem for groups Let N be a left Nearring and N $\oplus$ H, the direct sum of the group (N, +) and a group (H, +). Then for every n εN we get an endomap θ of the set $\mathbb{N}$ + H as follows :

θ_n : (m, a) --> (n, o) if a $\neq$ o

and --> (mn, o) if a = o.

If M(N $\oplus$ H) is the endomap nearring of N $\oplus$ H, we get an embedding ψ : N - M (N $\oplus$ H) , n --> θ n.

He is now half way through the chapter on Radicals, following the one on Basic Concepts since the redicals of a nearring are much more complex in nature than those for rings. He has been proceeding cautiously. Maximality, Primitivity and modularity have been made starting points. He is using nearring modules to unify concepts.

Statistics :

The Institute took up, in the middle of 1992-93, a Project entitled "Study of the Availability and the Requirements of S & T Manpower in Assam in next 20 years" sponsored by the Department of Science & Technology, (DST), Govt. of India with Prof. J. Medhi as the Principal Investigator.

The field-survey part of the Study was started at the beginning of the current year. The survery work involved collection of information on employment of different categories of Scientific and Technology personnel with related details in prescribed schedules/questionnaire, from a large number of Central and State Govt. Departments, Public sector undertakings, selected industrial units, business service and professional establishments in the private sector. Satisfactory progress has been made during the year. The field-work is almost complete. Srcutiny and coding of the schedules/questionnaire is going on. The tabulation plan has been prepared. The Computer Division of the Institute where data-processing will be done, has initiated preparatory work like preparation of Data-entry formats, programming etc.

Side by side, collection of secondary data from various sources like University, Education Department, Census, National Sample Survery etc. and analysis of data on selective basis are going on.

Resource Management and Environment :

The pollution of the environment by crude oil and wastes is of great concern to North Eastern India. Being a oil producing area, extensive drilling and petroleum operation are carried out in wide areas of this region. Petroleum wastes have also been added to the environment by three petroleum refineries as well as from the extensive net work of pipe-line for transportation of crude and natural gases in Assam. The extent of the pollution has never been assessed and it is reasonable to assume that the effect of oil pollution on environment could be more serious in this region than elsewhere in India. Keeping this view into consideration, the present investigation concerns the "Study of the impact of oil exploration on microflora in rice fields soil of Upper Assam".

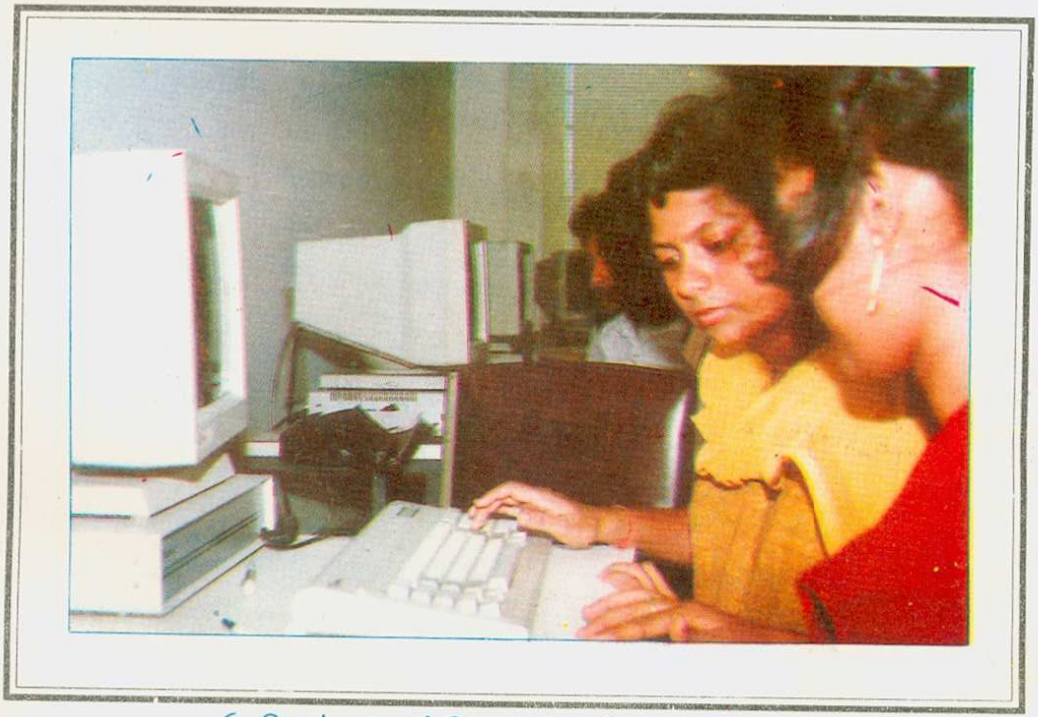
During the year 1993-94, investigations of physico-chemical properties viz-determination of exchangeable ions, hydraulic conductivities and presence of oil and grease in petroleum polluted soil have been carried out. The quantification of micro-organisms responsible for carrying out various soil processes such as nitrification, ammonification, nitrogen fixation by free living micro-organisms have been investigated. Experiments on impact of crude oil on growth and survival of rice plants were carried out. Grain quality in respect to presence of heavy metals was also investigated during this period.

Studies on the physico-chemical properties of the soil samples collcted from different distances of GGS (Group Gatherng Station) in the oil fields at Moran, Rudrasagar, Lakowa, Geleky and Barholla show that up to a distance of 100 meter from GGS, the oil exploration has a significant role in soil conditions. However, the soil micro-organisms were found to be increased in the vicinity of the GGS, this may perhaps be caused due to the presence of hydrocarbons in the soil polluted by the oil exploration, which are utilized as energy source by certain micro-organims and this may lead to enhance the microbial growth in the nearby region.

The experiments carried out on the oil polluted soil contained in plastic pots reveal that the heavy metal content increases with the increase of concentration of crude oil. From the studies on estimation of heavy metals like Pb and Zn present in rice grain and rice husk it is noted that these two heavy metals content were found to be hgiher concentration in rice husk and grain grown in soil containing higher concentration of crude oil. Results indicate that rice plants, grown in petroleum contaminating soil, absorb the heavy metals from soil through plant to grain.

Concentration of crude oil at 1000 ppm, the rice plant can survive and their growth was found to be normal. But with increasing the concentration of crude oil in the soil above 1000 ppm, the survivability of rice plant gradually declines and ultimately at a heavy concentration the rice plant can not survive at all.

5. Soil Analysis of the oil fields of upper Assam, in Progress.



6. Students of Computer Science Division busy in computer programming.

MANPOWER DEVELOPMENT PROGRAMME

Computer Science and Technology :

During 1993-94, the Computer Science Division of the Institute of Advanced study in Science and Technology has generated another batch of trained personnels under the various courses conducted in Computer Science and Application. Moreover, specific jobs were also done for projects and doctoral theses from different Institutions like the Gauhati University, College of Veterinary Science, Assam Agricultural University, Cotton College, Assam Engineering Institute, etc. The Division has helped in the research programmes of the Institute of Advanced Study in Science and Technology by providing computer time and consultancy services whenever required. Other jobs included some statistical data analysis as well as graph preparation for research scholars of the Institute.

SPECIALIZED TRAINING PROGRAMMES :

The division has also conducted a specialized training programme of 3-months duration in computer applications for the technical personnels of the Directorate of Technical Education, Govt. of Assam under the World Bank Project.

The Division also deputed Shri A. Barman, Asstt. Professor to Assam Engineering Institute for conducting a 1-week training programme on "Computer Assembly, Hardware Maintenance and Trouble Shooting" for the technical Staff of AEI and other polytechnics of the State under the Directorate of Technical Education, Assam.

OTHER TRAINING PROGRAMMES:

The Computer Science Division has been conducting the following courses in Computer Science and application :-

(a) Certificate course of one-month duration.

(b) Certificate Course of three-month duration.

(c) Certificate course of six-month duration.

(d) Post Graduate Diploma in Computer Application of one-year duration.

During the year 1993-94, the number of students trained up through different courses are given below :

Name of Courses	No. of Students Admitted	No. of Students Passed out.
1. Post Graduate Diploma in Computer Application.	35	19
2. Certificate Course of Six-month duration.	28	14
3. Certificate Course of three-month duration	35	30
4. Certificate course of one-month duration.	72	72

HIGHER STUDIES :

The IASST has also sponsored Shri A. Barman, Asstt. Professor, Computer Science Division on duty for the M.S. higher degree in Software Systems under the Distance Learning Programme at Birla Institute of Technology and Science, Pilani for the Session 1993-94.

Academic Achievements :

1. Smti Jayashree Goswami working in the Life Science Division has been awarded Ph.D degree by the Gauhati University for her thesis, "Effect of Magnesium in Liver functions with Special Reference to Liver Enzyme. " She worked under the guidance of Dr. P. Goswami, Director, IASST.

2. A project proposal on " Development of Mathematical and Statistical Science Division" was submitted to the Department of Science & Technology, Govt. of India. An expert team of the DST visited the IASST and on the basis of the recommendations of the expert team, the DST has approved the project proposal and sanctioned an amount of Rs. 54.50 lakhs for a period of five years for the implementation of the same.

7. Students of Computer Science Division engaged in data analysis.

RESEARCH PUBLICATION

Plasma Physics :

1. Chutia, Joyanti; Buragahain, A. & Bailung, H.; Chaotic threshold in Ion-beam Plasma system, accepted for publication in the proceedings of International conference on Plasma Science and Technology, (ICPST), 94 Chengu, China.
2. Bailung, H., & Nakamura, Y.; Observation of modulational instability in a mulicomponent Plasma with negative ions; Journal of Plasma Physics Vol. 50 part-2 (1993) 231.
3. Buragohain, A; Bailung, H; Sarma, B. K. Chutia, Joyanti & Nakamura, Y.; Chaotic Attractor in Ion-beam Plasma System,. Solitions & Fractals Vol. 4 No. 2 (1994)
4. Das, G.C. and Sen, K.M.; Double layers and collapsible waves in Plasma expected in interplanetary space; Earth, Moon and Planets, 1994 (in press)
5. Das, G.C.; Singh S.S. and Singh, Kh. I.; Propagation of various K-dv solitary waves in an inhomogeneous two temperature electron Plasma; Communicated to Planetary and Space Science.
6. Das, G.C.; Characteristic aspects on the stability of Kadomtsev-petviashvili solitary waves in Plasmas; Communicated to chaos, soliton and Fractals.
7. Das, G.C. and Singh, S.S.; Observations of solitary waves and corresponding double layers in relativistic inhomogeneous space Plasma; Communicated to International conference on Plasma Physics to be held at Brazin From Oct. 31 to Nov. 4. 1994.
8. Das, G.C & Sen, K.M.; Various turbulences in ion-acoustic solitary waves in Plasmas, Planerary & space science, 1994 (in press)
9. Dwivedi, C.B.; Collisionless damping of electrostatic dust drift mode in dusty Plas mas due to dust charge fluctuation dynam ics; Asian Journal of Physics (1994).
10. Dwivedi, C.B. and Tripathy, S.C.; Non-linear shock structure in a weakly ionised magneto Plasma; Annals Geo. Physicallogy accepted for publication.
11. Dwivedi, C.B.; Effects of dust charge fluctuation dynamics on the linear and non-linear behaviour of low frequency electrostatic purturbations in dusty Plasmas; Physics lett. A (1994).
12. Dwivedi, C.B.; Non-linear saturation of curvature induced low frequency instability; Phys. Plasmas (1994).
13. Nakamura, Y. Bailung, H.; Modulational instability in multicomponent Plasma with negative ions; Proc. of 8th National symposium of Plasma Science & Technology, Allahabad (1993) P. 19
14. Pandey, B.P., Avinash, K and Dwivedi, C.B.; Jeans instability of a dusty Plasma, Phys. Rev. E (1994).
15. Sarma, B.K. Buragohain, A. & Chutia, Joyanti; Periodic window & period substracting in an Ion-beam Plasma system; Journal of Bifurcation & Chaos Vol. 3 No. 2 (1993) 455-458

Life Sciences

1. Azad, P. Reduction yield of acid limes infected with citrus corky vein virus in Assam. Int. Citrus Virologist, 12th Pro ceedings/ + dk, G-432-15752. (1993).
2. Azad, P.; Synergistic effect of two essential Oils against some Pathogenic fungi, Ind. Phytopath. Soct. Zonal Chapter Meeting (Dec. 10 & 11, 1993) Bagalpur : page 10.
3. Azad, P. Efficacy of some essential Oils against Beauveria bassiana (Bals) Vuill. Assam Science Society Abstracts paper 1993 : page 28.
4. Azad, P. Studies on antimicrobial activities of some essential oils, Indian perfumer, (Sent for publication), 1994.
5. Devi, Rajlakhmi & Goswami, P; Long Term Feeding Effects of clerodendrum colebrokranum paper Presented in the technical session of the Assam Science Society (Abstract published)
6. Goswami, P. & Sarma, R.K.; Effects of terminalia chabula on some biochemical parameters (communicated to Jour. Res. in Ayurvedie & Siddha, Council of Assam.
7. Goswami, P. and Devi, Rajlakhmi; Effect of Clerodendoum colebrookianum on ciculating insulin. paper communicated to Jour. Ind. Med. Res. Council.
8. Goswami, P. and Kotoky, J.; Chmical Investigation on Indian Clerodendron: part I : Bioassary Guided study on a potent Hypotensive plant, Clerodendron Colebrookianum, Walp, Published in this proceedings of the National Seminar on Chemical Reactivity, Recent Irend, held at G.U. Nov. 1993.
9. Goswami, P. & Kotoky, J. ; Biossay Guided Phytochemical Investigation of Potent Me dicinal Plant of N.E. Region." Abstract published in Annual Technical Session, Assam Science Society, P. 54-55.
10. Goswami, P. and Kotoky, J. " Studies on Medicinal Plants Chemical Investiga tion on Clerodendron colebrookianum, Walp., Abstracts of the 8 Ist Session of the Indian Science congress Jaipur Session, 1994.
11. Goswami, P. and Kotoky, J, " Chemical constituents of the leaves of Clerodendron Colebrookianum Walp., a potent Hypotensive plant", Journal of the Indian Chem. Soci ety, Accepted for publication, 1994.

Mathematics :

1. Bhattacharjee, M & Dwivedi, C.B.; Scaling Laws for Plasma transport due ton -driven tubulence, Communicated to Plasma Phys ics and controlled Fusion, (1993).
2. Bhattacharjee, M.; Finitely presented infinite nearly simple Group Communi- cated to the Annals of Mathematics, (1993).
3. Bhattacharjee, M. ; A finitely presented infinite nearly simple amalgamated free product ; Communicated to the Journal of the Assam Science Society (1994).
4. Bhattacharjee, M.; On solvable surface kernal factor groups of Fuchsian triangle groups; Communicat to the London Mathematical Society,(1993).
5. Tamuly, B. K.; Substructure of abstract Affine Near-rings; to be Communicated for publication.

Environment :

1. Deka, S. Devi, A. barthakur, H.P. & Kagti L.C.; Impact of Gas flaring on Physico-chemical properties and occurence of mi croflora in rice field soil at Rudrasagar oil field of Assam. Environment & Ecology (Accepted).
2. Deka, S. Baruah, C.K., Effect of aeration factor on the growth of Rhizobium Sp. Journ. Ass. Sc. Soc, 35: (3) pp-180-188 (9193).
3. Deka, S. Baruah, C. K.; Effect of storage temperature and storage period of carrier materials on the growth and survival of Rhizobium Sp. of Green gram (P. aureus Roxb.)(Abstract) Ann. Tech. Sec. Ass. Sc. Soc.; (1993).
4. Devi, A.,Barthakur, H.P. Bhattacharyya, K. G. ,Impact of oil field operations on soil quality (Abstract) Ann. Tech. Sec. Ass. Sc. Society 1993.

SEMINAR/SYMPOSIUM/MEETING ATTENDED

1. Dr. P. Goswami delovered a talk of Energy crisis in the " Biological systems and significance of genetics in clinical practice" in the Gauhati University and the Regional Dental College respectively.

2. Dr. J. Kotoky attended the National seminar on " Chemical reactivity" held at the Gauhati University during 23-25 November, 1993.

3. Dr. J. Kotoky attended the seminar cum workshop on GC-Ms held at Calcutta on 10 February, 1994.

4. Dr. J. Kotoky attended the seminar on Chemical Industries held at Gauhati University during 22-23 March, 1994.

5. Dr. J. Kotoky attended the seminar cum workshop on H.P.L.C. held at Tocklai Experimental station, Jorhat, on 15 September, 1993.

6. Dr. Meenaxi Bhattacharjee participated at the workshop on statistics organised by the Deptt. of statistics, Gauhati University in 1993.

7. Dr. Meenaxi Bhattacharjee delivered lectures for orientation Course for College Teachers at the Academic staff college held in January, 1994 at the Gauhati University.

8. Dr. Joyanti Chutia attended the International Conference on Phenomena in Ionised Gases held at the Ruhr University, Germany during 19-24 September, 1993.

9. Shri A. Buragohain and Sri H. Bailung attended the third SERC School on Plasma Processing held at the Pune University during May 25 to June 15, 1993.

10. Shri H. Bailung attended the training Programme on Plasma Diagnostics held at the Delhi University, Plasma Research Laboratory during 1-28 February, 1994.

11. Dr. J. Chutia, Dr. M. K. Kalita, Dr. C. B. Dwivedi, Shri H. Bailung and Shri B. K Sarma attended the 8th National Symposium of Plasma Science & Technology held at the Allahabad University during 11-14 October, 1993 and each of them presented research paper at the symposium.

12. Dr. P. Azad attended the Indian Phytopath. Soct. Zonal chapter meeting held at Bhagalur during 10-11 December, 1993.

13. Dr. S. Deka participated at the Annual Review and Monitoring meeting of on-gning project of the Ministry of Environment & Forests. Govt. of India, held 2-4 Nov. 1993. at RRL Bhubaneswar.

ON GOING PROJECTS

Projects	Sponsoring agency/organisation
1. A Study on the impact of oil exploration on microflora in the rice field of upper Assam.	Ministry of Environment and Forest, Govt. of India.
2. Study of Chaoic Phenomena in Plasmas.	Ministry of Science and Technology, Govt. of India.
3. Study of Availability and Requirements of S &T Manpower in the State of Assam in the next 20 years.	Ministry of Science and Technology, Govt. of India.
4. Studies on some aspects of Muga Silk Worm, Antheraea Assamesis.	Assam Science Technology and Environment Council, Govt. of Assam.
5. The Phytochemical basis of the biological effects of the medicinal plants.	Deptt. of STE, Govt. of Assam.
6. Correlation of Alkaline posphatase trigey cerides and other lipids in the atherosclerosis.	Deptt. of STE, Govt. of Assam.
7. Hepatoprotective actions of the medicinal Plants.	Deptt. of STE. Govt. of Assam.
8. Effects of carcinogen on retinol binding protien.	Deptt. of STE, Govt. of Assam.

SEMINAR/CONFERENCE ORGANISED

1. Dr. (Mrs.) Meenaxi Bhattacharjee, Assistant Professor, Mathematical Sciences Division, IASST. delivered talk "Post Graduate Teaching of Mathematics in India & Abroad"

2. Dr. J. Chutia, Associate Professor, IASST and Dr. G. C. Das, Associate Professor, IASST. delivered talk on "Future of Plasma Physics Research and possible Application of Plasmas".

3. Dr. J. Katoky, Assistant Professor, Life Science Division, IASST. delivered talk on "Phytochemistry guided biological assays of medical plants ".

4. Dr. S. Deka, Assistant Professor, Resource Management and Environment Division, IASST. delivered talk on " Role of Micro-organisms in petroleum polluted soil"

5. Sri Deepak Goswami, Principal System Analyst, N.I.C., Govt. In India, Guwahati-6. delivered talk on " Graphic presentation".

6. Sri Anupam Barman, Assistant Professor, Computer Science Division, IASST. delivered talk on " Computer Simulation".

7. Sri A. K. Singh, Principal System Analyst, N.I.C., Govt. in India, Guwahati -6. delivered talk on " Computer Network and Socio-ecenomic Development of the Country".

ACADEMIC STAFF OF THE INSTITUTE

Hony Professor

1. Dr. J. Medhi,
Emeritus Professor, G.U. Mathematical Sciences Division.

2. Dr. B. K. Tamuli,
Emeritus Fellow, UGC,
Mathematical Sciences Division.

3. Dr. K. D. Krori,
Mathematical Sciences Division.

4. Dr. J. N. Talukdar,
Life Science Division.

5. Dr. L. C. Kagti,
Resource Management and Environment Division.

Visiting Faculty Member :

1. Dr. Y. Nakamura,
Institute of space and Astronautical Science Tokyo, Japan.

2. Dr. J. Roy,
Indian Statistical Institute, Calcutta.

3. Dr. G. P. Bhattacharjee,
I.I.T., Kharagpur,

4. Dr. G. Baruah,
I.I.T. Kanpur.

5. Dr. P. Gupta,
I.I.T. Kanpur.

6. Dr. M. Dutta,
Gauhati University.

7. Dr. H. K. Baruah,
Gauhati University.

Plasma Physics Division :

1. Dr. Jayanti Chutia,
Associate Professor.

2. Dr. G. C. Das,
Associate Professor.

3. Dr. M. K. Kalita,
Secretary (i/c)

4. Dr. C. B. Dwivedi,
Assistant Professor.

Life Science Division :

1. Dr. P. Goswami,
Director.

2. Dr. P. Azad,
Assistant Professor.

3. Dr. J. Kotoki,
Assistant Professor.

Resource Management and Environment Division :

1. Dr. L. C. Kagti,
Professor (Hony).

2. Dr. S. Deka,
Assistant Professor.

Mathematical Sciences Division :

1. Dr. J. Medhi,
Professor (Hony)

2. Dr. B. K. Tamuli,
Professor (Hony)

3. Dr. K. D. Krori,
Professor (Hony)

4. Dr. Meenaxi Bhattacharjee,
Assistant Professor.

5. Sri D. N. Das,
Chief Statistician.

Computer Science Division :

1. Sri A. Barman,
Assistant Professor.

2. Sri B. Bora,
Jr. Programmer.

3. Ms. L. B. Mahanta,
Jr. Programmer.

4. Sri N. Bhagawati,
Senior Instructor.

5. Ms. Madhuri Talukdar,
Instructor.

6. Ms. Pragoti Choudhury,
Instructor.

Research Fellow/Scholor :

1. Sri B. K. Sharma
2. Ms. A. Devi
3. Ms. R. Devi
4. Ms. D. Devi
5. Ms. J. Goswami
6. Ms. N. Barua
7. Sri H. Bailung
8. Sri A. Buragohain
9. Sri R. Sarma
10. Sri S. Dey
11. Sri R. P. Bhatta
12. Sri Prasanna Deka
13. Ms. Smita Duorah.
14. Sri Deepak Sarma.
15. Sri Kaushik Saha

Supporting Staff :

1. Sri M. Singh
2. Sri J. Das
3. Ms. J. Bordoloi
4. Md. S. Talukdar
5. Sri S. Goswami.

Administration :

1. Dr. P. Goswami, Director
2. Dr. M. K. Kalita,
Secretary(i/c) & Administrative officer
3. Sri M. C. Baruah, F.A.O.
4. Sri R. Sarma, P.R.O.
5. Sri P. K. Deka, U.D.A.
6. Sri S. Sarma, Accountant
7. Ms. S. Bora, L.D.A.
8. Sri R. Kalita, L. D.A.
9. Sri R. Mahanta, Jr. acctt.
10. Sri D. Deka, L.D.A
11. Sri K. Baishya, Library Asstt.
12. Sri Nimai Hazam, Driver
13. Sri B. Deka, Massenger.
14. Sri U. Deka, Messenger
15. Sri S. Das, Messenger.

Laboratory Helper/Watcher :

1. Sri T. Talukdar
2. Sri Madan Kalita
3. Sri Gora Gupta
4. Sri N. Goswami
5. Ms. Madhabi Das
6. Sri K. Deka
7. Sri H. Medhi
8. Sri L. Saud
9. Sri A. Pathak.

COUNCIL OF THE INSTITUTE OF ADVANCED STUDY IN SCIENCE AND TECHNOLOGY (1994-97)

1. Dr. P. C. Bora Former V.C., Assam Agricultural University, Jorhat, Assam.	Chairman
2. Dr. P. Goswami Director, IASST	Director.
3. Dr. Bikash Sinha Director, Variable Energy Cyclotron Centre, Sector 1/AF Calcutta- 700 004 (Representative of the DAE, Govt. of India)	Member
4. Dr. A. C. Ghosh Director, Regional Research Laboratory, Jorhat.	Member
5. Dr. A. K. Goswami Director, ASTEC, Silpukhuri, Guwahati.	Member
6. Dr. D. N. Barthakur Former V.C. Assam Agriculture University, Jorhat (Co-opted).	Member
7. Shri U. Miri Director, Technical Education, Kahilipara, Guwahati.	Member
8. Dr. K. C. Baruah Rector, Dibruagarh University, Dibrugarh.	Member
9. Secretary, Department of Science, Technology & Environment, Govt. of Assam, Dispur, Guwahati.	Member
10. Secretary, Department of Education, Govt. of Assam, Dispur, Guwahati.	Member
11. Dr. B. D. Barua President, Assam Science Society, Guwahati.	Member
12. Dr. H. L. Duorah Professor, Deptt. of Physics, Guwahati University, Guwahati. (Nominee of the V.C. G.U.)	Member
13. Dr. D. T. Khathing Professor & Head of the RSIC, North Eastern Hill University, Shillong, (Nominee of the V.C., NEHU)	Member
14. Dr. P. C. Deka Professor & Head of the Department of Biotechnology, Assam Agriculture University, Jorhat, (Nominee of the V.C., AAU)	Member
15. Dr. K. C. Barua Director, Forensic Laboratory, Govt. of Meghalaya, Shillong, (Co-opted)	Member
16. Dr. G. K. D. Mazumdar Reader, Deptt. of USIC, Guwahati University, Guwahati. (Representative of the Assam Science Society)	Member
17. Dr. P. Azad Assistant Professor, IASST, (Representative of Academic staff, IASST)	Member
18. Dr. P. K. Deka General Secretary, Assam Science Society, Guwahati.	Member
19. Dr. M. K. Kalita Secretary (i/c), IASST	Member
20. Representative from CSIR	Vacant
21. Representative from U.G.C.	Vacant
22. Representative from D.S.T.	Vacant.

RECEIPT & PAYMENT A/C FOR 1993-94

Head	Sub-Head	Receipt Amount	Payment Amount
1. Computer	Fees & other receipt and Grant-in-Aid from Science & Technology and Environment Deptt. Govt. of Assam.	5,00,321.00	5,04,117.95
2. General	Other receipt and Grant-in-Aid from Central Govt. through the Deptt. of Science Technology & Environment, Govt. of Assam.	46,15,538.36	46,08,686.29
3. Muga Silk Worm.	Grant from the Assam Science, Technology and Environment Council.	1,21,000.00	2,22,188.00
4. Environment/ Oil	Grant from the Ministry of Environment & Forests, Govt. of India.	77,300.00	77,462.50
5. Manpower	Grant from Deptt. of Science & Technology, Govt. of India	3,00,000.00	2,22,810.75
6. Chaotic Plasma	Grant from Deptt. of Science & Technology, Govt. of India.	4,00,000.00	2,84,202.65
7. Education	Grant-in-aid from the Director of Higher Education, Assam	1,00,000.00	1,00,591.60
		Cash & Bank balance during 1993-94.	94,099.62

Dr. P. Goswami
Director, IASST
Guwahati.

Dr. M. K. Kalita
Secretary (i/c)
IASST, Guwahati.